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Agriculture

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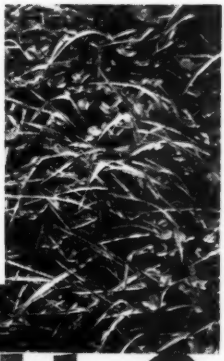
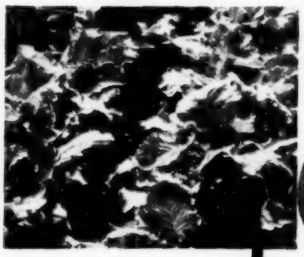


g. & Kale



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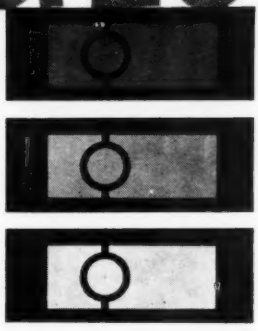

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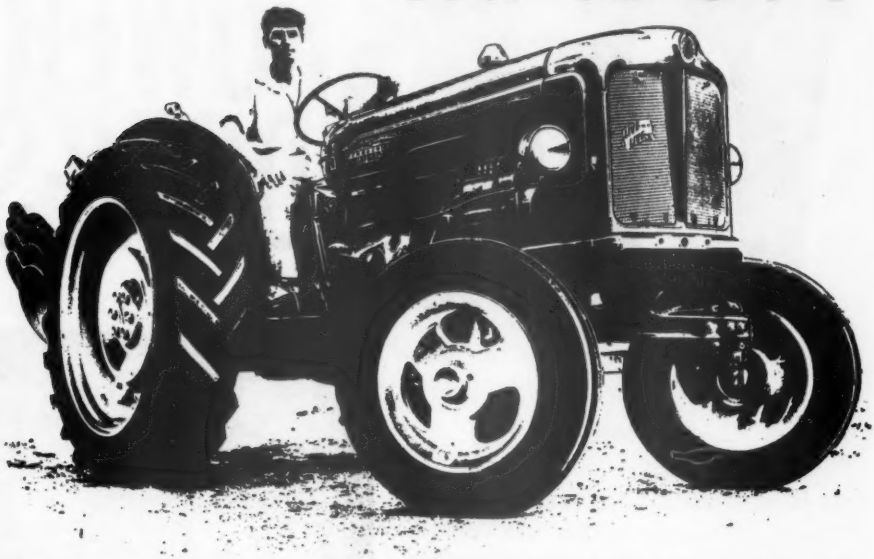

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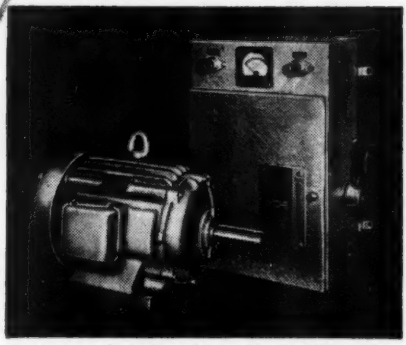

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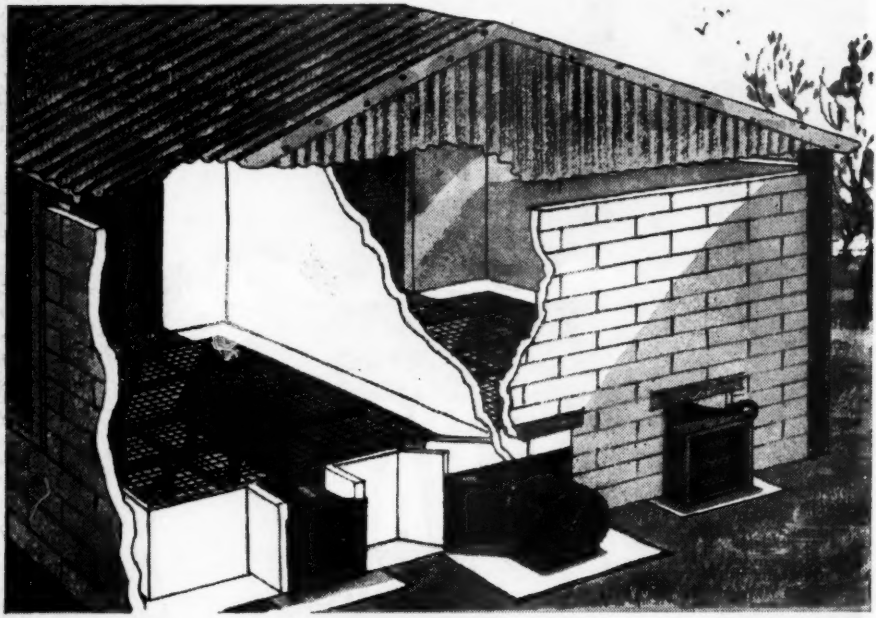

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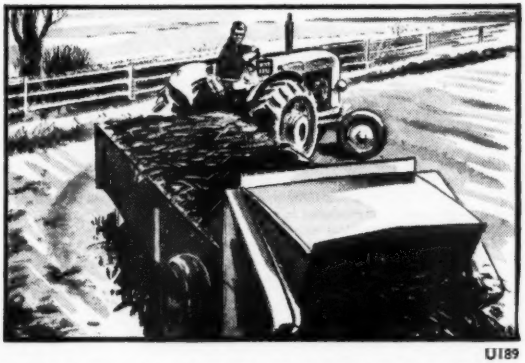

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Mechanization on the Medium-sized Arable Farm

D. B. WALLACE, M.A.

School of Agriculture, Cambridge University

Mr. Wallace discusses the problems of piecemeal mechanization and emphasizes the need to watch costs. Over-maintenance, in particular, is a trap for the unwary.

ONE of the outstanding characteristics of arable farms today is the great amount of machinery and mechanical power used by the farmer and his staff. The main reason for this has been a need to expand production from the fixed amount of land, without using more labour. Many people think that this mechanization has led to a decrease in the amount of regular labour used, but this is not so. In 1942 the agricultural returns showed 541,000 regular workers in the industry, with 95,000 tractors. By 1957, the number of workers was 527,000 and the number of tractors had increased three-fold to over 350,000.* There are several good reasons for this apparent anomaly, but they need not concern us now, though some will be discussed later on. It is sufficient to say that the output per man-hour increased greatly in the period, with the assistance of mechanical equipment and the advances made in various branches of agricultural science.

Normally, when a farmer buys an expensive piece of mechanical equipment, he does so to reduce costs per unit of product. He may do this either by reducing total costs, perhaps through a permanent reduction in his own labour force, or by an expansion of production while keeping the labour force static.

The latter method has been by far the most common on arable farms. The tendency has been towards a simplification of rotations, and fewer crops—but with bigger acreages. In many cases farmers have reduced the proportion of grassland, especially permanent grass, while keeping the same labour force. These bigger acreages of fewer crops have been necessary to defray the high costs of specialized machinery. The cost per acre of a machine falls as a greater acreage is worked, because though the operating costs—labour, fuel, repairs, etc.—will remain the same *per acre*, the overhead cost of the price of the machine (or its annual depreciation allowance) is spread over more acres and so is less *per acre* as the work done increases.

One noticeable drawback to much of the more expensive machinery on farms is its very specialized nature. A combine, costing perhaps £1,500 or £2,000, will harvest very effectively several types of cereal and pulse crops, but obviously it will not help at all in any of the preparatory operations,

* These labour figures are not entirely comparable, but they are good enough to show that increased mechanization was not accompanied by a marked fall in the labour force.

ploughing, drilling, etc., nor is it any use for harvesting a wide range of other crops—roots, conserved grass and so on. This specialization, coupled with the high initial cost, resulted in many farmers having too much money tied up in mechanical equipment because they had tried to mechanize their farms without altering the basic pattern of cropping. Most successful farmers have found that as mechanization has proceeded, so they have had to concentrate on growing more acres of fewer crops. This in turn has posed additional problems of labour use, with peak periods of great activity alternating with slack periods when a good deal of maintenance work is quite frankly spun out to occupy the day—another example of "Parkinson's law". These may seem harsh words, especially from someone not actively engaged in farming, but most people will agree, at least privately, that there is substantial truth in them so far as arable farms are concerned.

Additional reasons for mechanization are that it may make for easier physical work. Driving a combine is less tiring than pitching sheaves; it is pleasanter to ride a potato-planter than to plant on foot, and so on. This greater ease may very well pay in far greater output per man and a more contented staff.

Finally, a substantial amount of mechanization is carried out to provide a safeguard against weather risks. In theory, combines can cut perhaps 25 acres per foot of cutter bar. On many farms the actual ratio is barely half that. Does that mean they are wastefully employed? Not necessarily, if the extra capacity means the difference between a harvest successfully snatched in the face of bad weather and one that is washed out. This is why many smaller farms, with perhaps 50 to 100 acres of cereals, possess a second-hand combine as an insurance. Of course, like all insurance, it is possible to pay too high a premium, and this again is one of the main problems facing a farmer intent on mechanizing his holding. Just how much can he afford to pay for greater security from weather risks?

To sum up so far—the main reasons for mechanization on arable farms are to reduce unit costs, to provide easier and more effective working conditions and to hedge against risks, especially from the weather. But as machinery is expensive (mechanical costs account for about 20 per cent of all costs on arable farms) the farmer has to be careful to judge the amount of mechanization in which he indulges, and must try to get the best balance he can.

Problems of choice and control

Mechanization problems can be divided into difficulties of choice and control. The major problems are bound up with the question which machines to choose? Clearly the actual machines selected will depend on the crops that are to be grown and many technical factors, such as type of soil, volume of crops, amount of labour available, engineering aspects, and the personal attitudes of the farmer and, to some extent, of the workers.

The crops to be grown will also depend on various economic and technical factors, such as suitability of the farm, expectation as to prices and so on, but will also depend upon the type of mechanization to be adopted. Therefore we are in some danger of a circular argument: the machines depend upon the crops, the crops depend upon the machines. In fact, most farmers

select crops primarily and machines as the second step. But when a completely new farm organization is being drawn up, as on the entry of a new occupier, it is possible to be much more drastic in the planning of crops and machines, and to choose a pattern of cropping which will lend itself to full-scale mechanization and a relatively small labour force. In other words, when starting from scratch, the opportunity is available to produce a streamlined organization, to make the fullest possible use of both men and machines, and to keep the number of both to a minimum.

It may well be asked why this should not apply equally to an existing organization. In theory it would, but in practice most farmers are reluctant to alter an existing pattern radically except under the greatest compulsion, say of continuing low profits or actual losses. As a result, mechanization takes place piecemeal, individual processes being mechanized at different periods. In the original pattern of cropping, there may well have been a number of small acreages of similar crops designed to spread labour use over the year. When new machines arrive, for part, but not all, of the processes involved, it is usually some time before thought is given to the reorganization of the cropping pattern to give the larger acreage of some crops which are necessary to make proper use of these machines. Therefore, for some years the machines are under-employed, and hence expensive, while the habit of using them at half speed becomes ingrained in management and labour.

But even more important with this mechanization by instalments is the fact that it is rare that much effect can be made on the overall labour requirement until the whole process is completed. As much of the mechanization has been undertaken without much thought about how it will fit into the whole farm organization, we get the common result of a farm carrying perhaps twice the real value of machinery that sufficed at the end of the war, but with little or no reduction in labour. We might expect this to show up in reduced profits, but this has not been so, for increases in output per acre due to improved techniques and varieties of seed have masked the extra cost for the time being.

Balancing labour requirements over the year

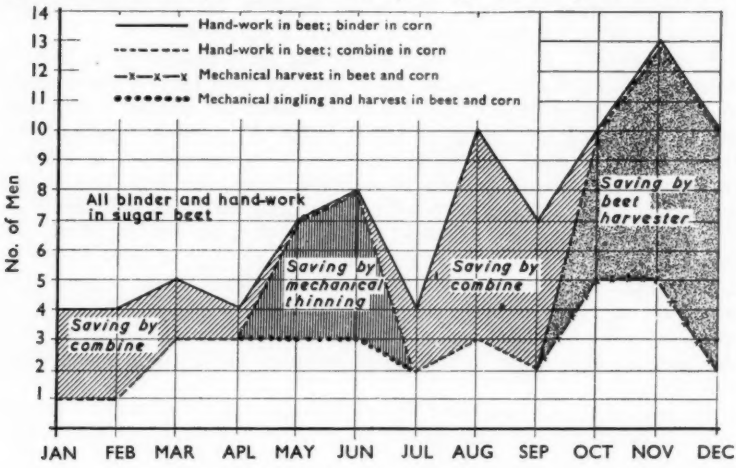
Nevertheless, with farmers facing sterner times ahead, it is perhaps worth looking at the lack of balance between labour requirements at different periods in the year which has been produced by haphazard mechanization.

In the diagram on p. 112, the labour requirement in men (assuming no casual workers) is shown for a 200-acre arable farm without livestock, growing 75 per cent in cereals, 25 per cent in sugar beet. The first line shows the men required throughout the year if all the corn is cut by binder and the beet dealt with by hand.

Admittedly, in practice no farmer would try to grow such a large proportion of his farm in sugar beet unless he could count on some casual labour. But even if five or six casuals could be found, it is likely that the labour force would still be seven or eight regulars. After mechanizing the corn crops, the number of regulars might still remain nearly the same. Where the sugar beet harvester is introduced, a real chance of reduction is possible—assuming plenty of casual labour still. But once full mechanization has been

implemented, the basic workers *on this organization* could hardly be less than five, as casuals cannot be asked to operate expensive equipment with any degree of success.

Labour distribution for 200-acre arable farm by method of mechanization



The lesson of this is surely two-fold. There would be a great saving in *total* labour if all the work were done initially by regular men. If, however, casuals are employed to any extent at the seasonal peaks, even full mechanization—while saving the cost of casuals—will not reduce the permanent staff by more than two or three men. To effect a greater saving with *the same mechanization* would call for a rearrangement of cropping, with lower sugar beet acreages and some other mechanizable rest crop in its place. Therefore the real benefit of mechanization is likely to come about on existing farms only when the cropping pattern is altered to take account of the new equipment, and not when the existing pattern is rigidly maintained.

You may feel that far too much emphasis has been laid on labour reduction. The aim of mechanization should not necessarily be the reduction of the total labour force of a farm. This may be necessary when labour is hard to obtain, but normally the purpose should be to release labour for employment in more productive enterprises. It remains true that in general terms it is more profitable to expand output—by new enterprises or bigger units of existing ones—to take up labour released by mechanization than merely to stand that labour off.

But on existing farms it is unlikely that many farmers will be able to go the whole way towards a complete scheme in one go, and so it is here that the importance of a plan becomes apparent. The farmer, with advice perhaps from the technical expert, should try to draw up an overall plan for eventual attainment and work within that framework when making his plans.

Keep an eye on costs by budgeting

As he progresses from one step to another, he can estimate the benefit likely to accrue from each step by means of a partial budget. There have been numerous expositions during the past few years of this technique, and I shall not go into it again. It is sufficient to say that an account is drawn up to answer the following questions: What extra *cash* costs shall I incur? What extra sales shall I achieve? What present sales shall I lose? What present *cash* costs shall I save? Any District Adviser can help out in these budgets if the farmer is not sure what is involved. It is only necessary to remember that as these budgets are part of a planned programme, the extra benefit derived from one step may seem rather small—say because no full-time labour is saved—but that when it is coupled to the *next* step, a marked saving will be made.

Once the "master plan" has been drawn up and is under way, it is still necessary to exercise some control of costs. A budget should be prepared for the year ahead, showing the expected expenditure on new equipment and replacements, and any wide discrepancies between budget and the actual accounts should be investigated. But much more than that, a sharp eye must be kept on the running costs, both fuel and repairs, and budgets for the expected level of these costs should also be made out, based on past experience where possible. Keeping these costs within bounds is really a technical question requiring advice from engineers, but it will almost certainly pay farmers to keep maintenance logs for tractors and expensive pieces of equipment, to ensure that regular attention is paid to these factors. On the other hand, it is sometimes true that individual farmers get so taken up with this side of farm management that it becomes almost a fetish with them, and they concentrate upon it to the detriment of the general conduct of their business.

Finally, there is a need for moderation, even in the matter of maintenance and repairs. Too often a large sum is spent in doing up equipment that is just not worth it. It may seem heresy to say so, but it is quite easy to over-maintain farm equipment. There are few items of machinery on farms which are so valuable or delicate that they warrant the care and attention that would be reasonable for a top-class luxury car, yet quite frequently they do receive just that.

The problems of mechanization on arable farms are complex, involving the inter-relation of labour, machinery and production. But far more effective results than have been achieved on the majority of farms to date could be realized if mechanization took place on a planned pattern, with a definite objective at the end—say a known labour force and cropping organization. Once mechanization has been started, it is essential to keep a tight control on the costs, both of mechanizing and of operating the equipment. But expensive though farm machinery is, there is a reasonable limit of maintenance that is economical, and to exceed this can be extravagant.

Electrical Aids to Horticulture

R. MARSHALL

North Western Electricity Board, Kendal

Electricity has been of great benefit to Lancashire glasshouse tomato-growers, enabling them to produce heavier and earlier crops. Mixed nurseries, parks departments and landscape gardeners are also realizing its uses in bulb forcing, frost protection, propagation and seed testing.

THE Lancashire glasshouse industry has long been concerned mainly with the production of lettuce, either one or two crops—followed by tomatoes—from heated houses. But lettuce, particularly from heated houses, have not been very profitable in recent years, and the prices obtained for the complementary crop of late tomatoes have been even more disappointing. These trends, coupled with the introduction of electrical propagation methods, which enable a grower to have a plant ready for setting out just as early as he feels inclined, have resulted in a considerable shift to early tomato production.

Many of the glasshouses being used for the traditional cropping programme were not equipped with heating systems adequate to make the change-over feasible. To attempt early production without these facilities in the growing houses is not really practicable, and so alterations to heating systems have been needed in many cases before early tomatoes could be grown with much chance of success. Some growers have wisely introduced small-bore pipes, as recommended by the National Institute of Agricultural Engineering, in some cases to supplement and in others to replace their existing heating arrangements.

The installation of circulating pumps, operated electrically, has also increased the efficiency of existing four-inch pipe systems, and this improvement has been reflected in the crops. Where crops are grown only on a small scale, electrical space-heating equipment has been found useful for "topping up" on cold nights.

Most of the larger growers who now specialize in early tomatoes are propagating electrically. Of these, all are using heated benches and irradiators, and some use electricity for space heating as well. The North Western Electricity Board has recently provided high tension supplies with transformers either on or adjacent to ten nurseries to meet this increased demand, which is due entirely to the wider application of electricity as a direct aid to glasshouse cropping, in the form of light and heat.

It is not uncommon for small nurseries formerly using 2,000 units or less of electricity per year to be making good use now of 20,000 units or more for strictly horticultural purposes. A number of medium-sized holdings are using between 50,000 and 100,000 units a year.

Bench warming for propagation

One of the most important developments electrically has been the adoption of bench warming for propagation. This not only produces the requisite rooting temperature in the bench sand, but the heat given off from the

benches is also of material help to the space-heating system. There are now over 200 electrically-heated benches in operation in the north west, representing some 50,000 sq. feet of propagating bench area, which is used for a great variety of crops. The design of modern bench warming installations owes much to the original research carried out at the Electrical Research Association by Cameron Brown and Golding on the heating of soil by the use of galvanized, low voltage wires. Although this particular method has now been superseded for some applications by the use of plastic-covered heating cables, the research of many years ago has proved invaluable.

The introduction into this country of the mercury vapour lamp for tomato propagation by Lawrence, of the John Innes Research Station, some ten years ago is now proving to be of great assistance to those Lancashire growers who have gone over to early production. At least 200,000 tomato plants have been irradiated with mercury vapour lamps this season for the early crop, the number of lamps in use being equivalent to some eight miles of street lighting.

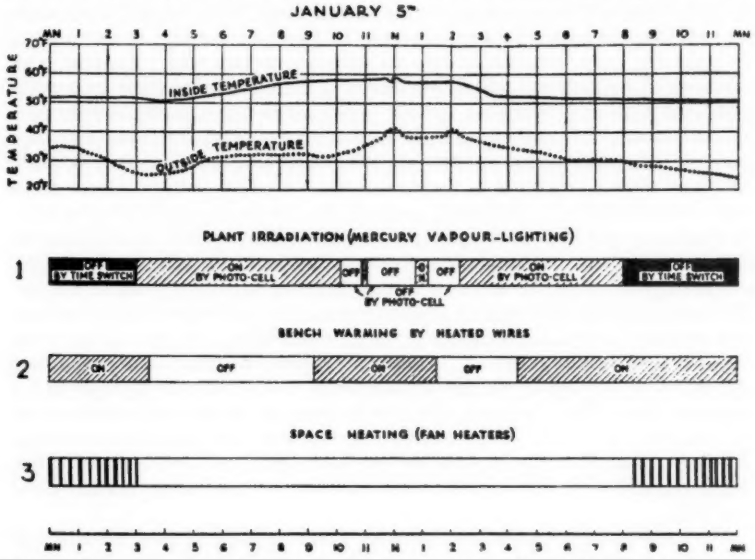
In 1952 the North Western Electricity Board carried out small-scale trials on the lighting of plants. Not only did such plants develop much faster on the propagating bench, but an average of 1½ lb of ripe fruit per plant was picked during May, compared with ½ lb each from unlighted plants. Half a pound of fruit per plant in May was then considered quite satisfactory for this part of the country. Results as good or better were obtained in similar trials over the next two seasons, and in 1955 an average from lighted plants of 2½ lb per plant in May was marketed. Since then attempts have been made to devise methods of producing even earlier crops, to make better use of the irradiators—by far the most expensive item of the capital equipment required for electrical propagation—and to improve methods of cultivation, to make the crop less hazardous. All who are in any way connected with commercial horticulture will know that new methods bring their own problems, and that such problems are not overcome in one season, or even two. There is no doubt whatever that in its early days the plant irradiator very nearly became the victim of its own virtue and efficiency, because it could produce a plant at a time of the year when very few people possessed the experience to grow it successfully to maturity. There is a world of difference in planting in the first week in February rather than the first week in March, and it took a year or two to learn that there would be little future for the irradiated plant if, with our present knowledge of very early tomato production, we continued to plant direct into a border that had been steam sterilized and winter flooded. Experiments carried out during the past four years, together with results observed on nurseries, show that success is probable if the plants are grown in whalehide containers during the early stages in the growing house. All irradiated plants on Lancashire nurseries are now grown in this way, the roots being allowed to run into the border as the plant develops. Success in this context means balanced growth as opposed to too much vegetative growth—so that the first flower truss develops normally and sets fruit.

Very few experienced tomato growers would pretend to have control over the water available to the plant once it is set out in the border. Night temperatures can sometimes be manipulated to advantage, but the light factor in the weather is already one uncontrolled element, and a free root run for

the plant obviously puts another and very important balancing factor beyond the grower's control. This is not to say that the whalehide method is the final answer in early production, as considerable additional labour is needed, compared with planting direct into the border. Experiments are continuing in the hope that a method just as reliable but more economical in labour and materials will be found. That a comparatively reliable method from sowing to setting has been evolved is apparent from the fact that seventy-five more irradiators were installed in Lancashire last season, about half of these being additions to existing lighting installations. On some nurseries, further extensions are already being planned for next season.

Control of night temperatures essential

It has often been stressed by research workers and others during the last few years that when irradiators are being used for tomato plant production, night temperatures should be properly controlled. Troubles have undoubtedly arisen when erratic night temperatures in the propagating house have been unavoidable during the irradiation periods. When supplementary lighting was tried out by the North Western Electricity Board in 1952, a controlled night temperature of 54–55°F was maintained during the period of irradiation, this being the temperature which had been adopted in previous seasons when bench warming was first being tested. No troubles arose. Rather lower night temperatures have been adopted on some nurseries, and good plants have consistently been produced, ready for planting the first week in February from a December sowing. The following diagram shows



Light and temperature control in the propagating house. (1) Lighting controlled by time switch and photo-cell. (2) Bench warming controlled by thermostat. (3) Space heating controlled by thermostat.

how temperature and light are controlled in an all-electric propagating house on a large commercial nursery in Lancashire. It will be noted that the night temperature maintained in this nursery is about 52°F. During the last week in January, temperatures higher than this may be required if the improvement in natural light warrants them, but some judgment is needed, and the course of action will depend upon the state of development the plant has reached at the time and on the prevailing weather. The earlier the temperature can be raised with safety, the better the results are likely to pay, and very careful control of temperature is necessary during January if the plants are at the right stage for the temperature to be increased. As February comes in, a night temperature of 60°F should be maintained when it has been sunny during the preceding day; and as very cold nights usually follow bright days in February, the importance of being equipped to maintain 60°F cannot be overstressed. As soon as the plant is safely in balance and setting freely, temperatures rather higher than 60°F are desirable if marketing is to begin in late April, and since the value of the crop will depend largely on how soon marketing commences, saving of fuel at this stage is no real economy.

Given a well-equipped propagating house with the heating and lighting system properly under control, and adequate heating of the growing houses with pipes sited near the ground, good cultivation can reasonably be expected to produce good results.

Experiments carried out at Kendal in recent years have indicated that marketing in early April is a commercial possibility; in fact, a commercial trial in Lancashire this season with 2,000 plants resulted in marketing taking place during the last week in March. A photograph on p. (ii) of the art inset, taken on 8th February this year, shows a tomato plant grown on a commercial nursery and brought into flower about two weeks sooner than has previously been achieved commercially in Lancashire with irradiated plants. This plant produced ripe fruit in the middle of April.

Other experiments, not in themselves of any immediate commercial value, have provided information on how flowers may be produced and set during the shortest days of the year, with the plant growing on under artificial light, the fruit setting in late December and ripening before the end of February.

Although the impact of electricity on horticulture in the north west has been most noticeable in the tomato growing industry, the use of bench warming for the propagation of many other subjects has expanded rapidly, particularly during the past two or three seasons. Bulb forcing in sheds or buildings, using electricity for lighting and heating, instead of in the traditional manner in glasshouses, is now finding some favour, and nine of these installations are in regular use in the Lancashire area. For this process, lighting is by ordinary tungsten lamps, and not mercury vapour as is the case with tomatoes. Carnation and chrysanthemum propagation on commercial nurseries is now mostly carried out with the aid of electricity. Mixed nurseries, parks departments and landscape gardeners are realizing its advantages, both for the frost protection of plants in glasshouses and frames and for propagation. An interesting application is illustrated by the second photograph on p. (ii) of the art inset, showing germination testing in progress on seeds at a commercial trial ground.

If electrical equipment is chosen wisely for the nursery functions which

it does best; if installations are designed to take full advantage of the flexibility which electricity alone can offer; and if the equipment is operated intelligently, the use of electricity on the nursery will continue to expand, to the benefit of both the grower and the supply industry.

THE MINISTRY'S PUBLICATIONS

Since the list published in the May 1960 number of AGRICULTURE (p. 99) the following publications have been issued.

MAJOR PUBLICATIONS

Copies are obtainable from Government Bookshops or through any bookseller at the prices quoted.

BULLETIN

No. 48. Rations for Livestock (*Revised*) 7*s.* 0*d.* (7*s.* 11*d.* by post)
Describes the principles of feeding and how rations should be computed for every class of livestock to give the best results. Contains many tables showing the composition and nutritive value of feedingstuffs.

OTHER PUBLICATIONS

Fatstock Guarantee Scheme 1960–1961 (*New*) 2*s.* 6*d.* (2*s.* 10*d.* by post)

LEAFLETS

Up to six single copies of Advisory Leaflets may be obtained free on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 3*d.* (5*d. by post*).

ADVISORY LEAFLETS

No. 291. Black Scurf and Canker of the Potato (*Revised*)
No. 318. The Mole (*Revised*)
No. 441. Nitrogenous Fertilizers for Farm Crops (*Revised*)
No. 445. The Smith Hive (*Revised*)

FIXED EQUIPMENT OF THE FARM LEAFLET

No. 16. The Bull Pen (*Revised*) 9*d.* (11*d.* by post)

HORTICULTURAL MACHINERY LEAFLET

One free copy of Horticultural Machinery Leaflets may be obtained on application to the Ministry (Publications), Ruskin Avenue, Kew, Richmond, Surrey. Copies beyond this limit must be purchased from Government Bookshops, price 6*d.* (8*d. by post*).

No. 6. Control of Air Conditions in Horticultural Stores (*New*)

FREE ISSUES

Obtainable only from Ministry (Publications), Ruskin Avenue, Kew, Surrey.

Poultry Stock Improvement Plan Register—1960–61
Poultry Stock Improvement Plan Regulations—1960–61

UNNUMBERED LEAFLET

You Versus Pests—Rats and Mice (*Revised*)

The Wool we Want

S. R. BLACKLEY, M.B.E.

Manager and Secretary, British Wool Marketing Board

Last year the British wool clip sold for the highest average price in the world, which suggests that the flock owners of this country have already gone a long way towards producing the wool that the trade wants. But in Mr. Blackley's view, this is only partly true; there is still a lot of room for improvement.

ALTHOUGH British wool now makes the highest market price of its type per pound, the British farmer probably gets a lower gross return per sheep than the Commonwealth farmer producing cross-bred and carpet wools. This is because of two main factors: the fleeces of British sheep are generally lighter than those of sheep of the same breeds overseas; and a greater proportion of fleeces have defects (such as lack of uniformity of fibre, tenderness, kemp, etc.) in the United Kingdom clip. Both these factors operate because wool has received less emphasis in breeding and nutrition policies here than in the main wool-producing countries overseas. For example, the average fleece weight of sheep in New Zealand has increased by 23 per cent over the past 25 years. While there are no strictly comparable records available in the United Kingdom, what evidence there is suggests that there has been no consistent trend towards higher fleece weights in Britain over recent years. The picture is, of course, affected by changes in the proportions of particular sheep breeds in the national flock.

Perhaps the difference can be more strikingly illustrated by comparing the average fleece weights of a Kent ewe in England with the equivalent in New Zealand. The New Zealand sheep produces between 1 and 2 lb more wool per year than the English animal. This extra weight more than offsets the higher price per lb made by the British wool.

The average fleece weight of British sheep is only about 4¾ lb; in New Zealand it is 9·7 lb. This wide difference is mainly—but not entirely—due to the composition of the British sheep flock, which contains a high proportion of hill sheep, such as Welsh, Blackface, Cheviot and Swaledale. It is therefore quite impracticable—and, indeed would be a mistake—to attempt to raise the average fleece weight of the British flock to that of New Zealand.

Nonetheless, it is evident that fleece weight is the largest single factor affecting the returns of wool-producers, and an increase of only half a pound in average fleece weight would add 8½ million lb of wool to the British clip, increasing producers' returns by nearly £1·7 million. This is a more reasonable objective, and a very worthwhile one. It would add about 2*s*. to the annual income from each ewe in the country. But there are complications. Fleece weights above a certain level might only be obtainable at the expense of other factors of economic importance to the farmer and the wool trade. However, tests carried out on the effect of selective breeding and nutrition policies indicate that there is a considerable scope for improvement in fleece weights in British sheep before the point is reached where returns per

sheep would begin to decline. This point is naturally not a constant, and varies according to particular conditions, such as environment and the market for fat sheep and lambs. It must essentially rest with each individual farmer to decide how far he can increase fleece weight to the improvement of the productivity of his flock as a whole.

Research has shown that fleece weight is a heritable characteristic, and that the intensity of inheritance varies between different breeds. In the Merino breed the intensity of inheritance of fleece weight has been found to be as high as 30 per cent. In other breeds it is thought to be rather lower. Research in this country has not as yet provided guidance for the farmer on this point, but practical tests have shown that the average fleece weight of a flock can be significantly improved by selective breeding, even if the selection is confined to the ram.

Fleece weight is also affected by level of nutrition. Here again it is a question of reaching a balance which provides the maximum productivity from the flock as a whole. There is, however, a very great deal of evidence accumulating to suggest that a higher level of nutrition during the last four to six weeks before lambing is an economic proposition, especially on hill farms. The feeding of concentrates during this period has been shown to increase the fleece weight of ewes, as well as to provide benefits of improved health and a better growth rate of lambs. Obviously the first requirement of a sheep is to survive, but a little more wool should not make this more difficult. On the sheep itself, fleece weight is affected by the density of the coat, that is the number of follicles per square inch, and also by fibre length and diameter. Improved nutrition affects the latter factors particularly. As a general principle, fine wool is more valuable than coarse, but in recent years the difference in value has narrowed considerably. Thus, cross-bred wools have improved in value relative to Merino, and carpet wools have improved relative to cross-bred. In fact, the largest relative increase in value in recent years has been achieved by coarse Blackface wool. Thus a moderate increase in fibre diameter as a result of a reasonable increase in fleece weight is not likely to offset the improved financial returns per sheep.

Main physical faults

The main physical faults in British wool which cause loss in value are red or white kemp, grey and black fibres, cottiness (matting), tenderness and discoloration. Red kemp is a particular problem in wool from the Welsh breed and its crosses: its incidence has increased greatly in recent years. The proportion of Welsh wool graded as red kempy and light grey has now reached 40 per cent. The difference between the price for good average Welsh wool and red kempy wool is about 5*d*. a pound. This means that producers of Welsh wool are losing about £30,000 annually because of this defect. It is thought that the trend has been caused by the association, in some producers' minds, of red kemp in a fleece with hardiness, and that this has led to the selection of rams with this defect in their fleeces. The correlation, if true (and it is doubtful), may be a coincidence. It is probable also that there are hardy strains of the breed which do not have red kemp. The incidence of red kemp definitely limits the utilization of the wool in manufacture, as it affects strength of staple and dyeing characteristics.

White kemp is found in the fleeces of several British breeds, especially in mountain sheep. This defect may not be of much economic significance in some of the coarser hill wools, and a white kemp content is even considered desirable for the manufacture of certain textiles, such as Harris tweed. However, it does reduce the value to the trade of fine wools and lustre wools. It is a heritable characteristic which can be bred out.

Grey and black fibres also reduce the usefulness of wool and hence its price. While the presence of these fibres is most extensive in coarse wool, such as Herdwick, it has the greatest effect on value when found in fine wools such as Suffolk. The price difference between pick and super grey and black (grade 533) and the pick and super grades (505 and 506) is between 19*d*. and 22*d*. per pound. This represents a difference of about 10*s*. a fleece, which can be a very serious matter for a wool grower.

In the Blackface breed the presence of grey and black fibres has been on the increase. The proportion has nearly doubled since 1956. Such wool is worth 10*d*. a pound less than white wool. Again, this defect is heritable, and producers can improve their wool returns by avoiding rams with black and grey fibres in their fleeces.

Cotts are fleeces where the fibres have matted together on the backs of the sheep. Fibres are shed from the skin, and "felt" together with the fibres which are still growing. Cotted wool is difficult to process, and is worth about 6*d*. a pound less than good wool. It occurs mainly in heavy fleeces, and is thought to be due in part to faulty nutrition and other environmental factors.

Tenderness, or "break", in wool refers to weakness at one or more points in the staple. It is commonly considered to be due to sudden changes in the level of nutrition, but other factors, such as disease or hormone imbalance, may cause it. Fleeces with marked tenderness of staple would be placed in "cast" grades, at prices about 6*d*. per pound less than for good wool. The defects caused by cottiness and tenderness can definitely be reduced by avoiding sudden changes in the nutrition of a flock.

Discoloration

There are many forms of discoloration of wool. Some are caused naturally, and others are entirely the fault of the producer. For several years now the Wool Marketing Board has conducted an intensive campaign against the use of "bloom" dips, which stain wool. There is a deduction of 4*d*. a pound for tinted fleeces, and 1*s*. a pound if the fleece is badly stained. Education and price penalties have combined to produce a significant improvement in recent years, but a certain amount of discoloration due to dip is still found in the north. Tar marking has been practically eliminated by the same means, and producers are now using scourable marking fluids extensively.

Apart from man-made discoloration, a yellowing of fleeces known as "canary stain" has been more prevalent recently, especially during wet years. The stain is thought to be due to chemical decomposition of the cystine in the wool fibre, which occurs under prolonged moist and alkaline conditions. Affected wool has to be graded as "cast", and this may affect producers' returns considerably. An unfortunate feature of this condition is that the discoloration can develop in shorn wool while in store if it has been delivered

in a damp condition. So far, research has not been able to suggest methods of prevention or cure.

Staining of wool can also be caused by an infection of the skin of the sheep by an organism known as *Dermatophilus dermatonomus*. This causes mycotic dermatitis, or "lumpy wool". Symptoms are the presence of scab-like lumps in the fleece, and some subsequent green, grey or yellowish staining of the fibres. The disease is also associated with long spells of wet weather, and it caused a considerable loss of value in the United Kingdom clip two years ago. It is at present being investigated at the Ministry's Veterinary Research Laboratory at Weybridge.

The wool trade wants fleeces which are as uniform as possible. Within one fleece there can be a wide variation in fibre diameter, length, etc. The coarsest wool is usually found at the britch, and the value of the wool output of a flock can be increased by avoiding the use of rams with a large area of coarser wool extending upwards on to the back.

The United Kingdom wool clip is quite exceptional in its diversity. The many breeds and crosses contribute such a variety of wool that it has to be classified in about 320 different grades. Fortunately, the demands of the wool trade are also very varied, and there is a market for every type produced. The main uses for British wool are for carpets, knitting wool and tweeds. There are also certain "speciality" uses for British wool, such as the Italian mattress trade (long-stapled Blackface), paper felts (Southdown and Dorset Down), roller lappings (Lincoln) and industrial press cloths and bunting (Devon).

Improving the clip

There is still much that the British wool grower can do to produce and present his wool in the best form for the market. Firstly, he can produce more wool per sheep through breeding and nutrition (although he must do this carefully, and not to excess); secondly, he can breed out certain expensive defects, such as kemp and black and grey fibres, and avoid others by careful nutrition; and thirdly, he can prepare his wool for sale in such a way that it will gain for him the maximum return.

This last requirement means careful shearing (to avoid double cuts), proper rolling and tying of the fleece, and the avoidance of tar and staining dips. If he washes his wool, then it should be washed thoroughly and sheared within seven days. The financial difference between good and bad production and presentation can be quite striking. It should be the producer's aim to provide the wool that is wanted.

The Art of Barn Haymaking

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Barn hay drying has obvious advantages in wet weather, but even in a dry summer it can save labour and conserve more dry matter than field curing. The saving can be great enough to cover the total cost.

IT is not always appreciated how important the hay crop is to the economy of this country. In England and Wales there is a larger area devoted to hay than to the combined acreage of wheat and barley; and the cash value of the hay is higher than the total sales of wheat. Yet how much capital, labour and thought is devoted to growing and winning hay in comparison with the cereals? Although it is far more difficult to harvest hay than grain in good condition, the hay drying plants are very few in comparison with the grain driers which have been installed during the past ten years. The same invidious comparison can be made in the search for new techniques. Until recently the work devoted to the growing and conservation of hay at research stations and experimental farms was a fraction of that applied to, say, potatoes or wheat, yet the scope for increased efficiency in the conservation of hay is enormous. It is estimated that in an average year more than 30 per cent of the feeding value in grass is lost in haymaking. If we could bring our losses down to 20 per cent, over £6 million worth of animal feedingstuffs would be saved every year.

The loss of nutrients in haymaking is due to a number of causes. In the first place the hay continues to respire after cutting, and burns up valuable constituents. The longer it takes to kill the grass the longer it continues to breathe, and the longer the bacteria can live and break down the plant tissues. Rain washes out the soluble carbohydrates—the most valuable part of the hay. Wet hay develops moulds which feed upon the leaves and stems, causing further losses and making the hay unpalatable. If hay is baled too green there is excessive heating, and this too burns up valuable constituents of the hay and makes the protein less digestible.

To minimize these losses the hay must be dried quickly, and be sufficiently dry to prevent the micro-organisms breaking down the plant tissues. If the moisture is reduced to 20 per cent of the weight of the hay, this is sufficient to prevent further decomposition and the growth of moulds. Drying much beyond 20 per cent moisture is unnecessary, for in a damp climate the hay will re-absorb moisture from the air.

Grass drying by high temperature air is the ideal method, but costs are high, and unless one is dealing with young leafy grass of high feeding value it is too expensive. Barn hay drying is an alternative worth considering.

Three stages of drying

The drying of hay can be divided roughly into three stages, but obviously these stages overlap considerably. Starting with fresh material containing

about 80 per cent moisture, the grass will dry down to about 50 per cent moisture in 24 hours if it is kept moving and the day is fine. At this stage the drying slows down, and it may take a further 24 hours to bring the moisture down to 40 per cent. The second stage is to reduce the moisture from 40 to 30 per cent, and this requires not only a fine day, free from rain, but also comparatively dry air—a low relative humidity, as the meteorologist puts it.

The third and final stage is to dry from 30 per cent moisture to 20 per cent, when it is fit to store. This is the most difficult of all, for the air must be both dry and warm and must be able to circulate through the hay. If the air has a relative humidity of more than 90 per cent, the moisture in the hay cannot be reduced to less than 30 per cent, for at this point the moisture in the air and in the hay are in equilibrium. If one dries until the hay reaches a moisture content of between 20 and 30 per cent and then the air becomes moist, even if rain does not actually fall, the hay starts to pick up moisture from the air and becomes wetter. This often happens at night when temperatures fall, for as the temperature drops in the evening the air becomes moister, and eventually dew-point is reached. It is impossible to dry the hay down to the safe limit of 20 per cent moisture unless the relative humidity of the air is below 76 per cent for a reasonable period of time.

Keeping down the costs

Barn hay drying uses these three stages to keep costs down to the minimum. The first stage is fairly easily done outside, for one does not cut unless there is a chance of 48 hours without rain, and it is not essential that the sun should actually be shining. At the second stage the drying slows down, and there is an increasing chance of rain, so one can bale, or cart loose, to the barn where the hay can be spread out on the drier or packed tightly in bales. The fan is then switched on and air at normal temperature blown through the half-made hay for two or three days. By this time the third stage is reached, that is the moisture content of the hay is down to 30 per cent and dry warm air is necessary to finish off the process. Unless the weather is good the hay must have air which has been warmed artificially, if one wishes to replace the dried bales with fresh. Failure to provide heat at this point will often delay drying for some time, and it may be three weeks before one is able to switch off the fan.

If one has sufficient storage capacity, equipped with cold air fans, the protracted drying experienced in wet weather does not matter a great deal, for the hay is safe. Capital and running costs of a heater are avoided with cold air drying, but if drying is unduly long there comes a time when the cost of running a fan for weeks on end more than balances the cost of heating. Dry matter losses in the hay are also increased by slow drying. Normally, however, the cost of electricity for running the fan only is about 10*s*.–£1 per ton of dried hay.

The simplest way of providing heat is to install an electrical heater bank in front of the fan. This may be made detachable so that it can be moved from one fan to another, to ensure that it is in use for most of the time. The method is clean and involves the minimum of labour, but electrical heat is relatively expensive. Cheaper heat can be supplied from an oil furnace, but

capital costs are high. A heat exchanger should be incorporated to prevent the hay being contaminated by fumes, and to avoid the possibility of fire. Nevertheless the running costs of oil heating at present are appreciably less than those of electricity. Coke as a source of heat is however the cheapest, and has the advantage of low capital cost, for a furnace can be erected with unskilled labour, but the time taken up in stoking is slightly higher.

The art of barn hay drying is that of making the best use of each stage to promote rapid drying. Initially it is important to cut the grass when it is dry, and to ted immediately after cutting. Experiments carried out at various centres have shown beyond doubt that tedding immediately after mowing speeds up drying considerably. The forage harvester is a useful implement, and grass cut with this machine dries much faster, but unfortunately the breaking up of the leaves and stems results in a proportion of the crop being lost. This loss varies according to the crop being harvested, but is probably between 10 and 20 per cent of the dry matter. Tedding should continue as frequently as possible, for it is only when the wind is circulating freely through the hay that it is drying quickly and uniformly. Uniformity is important, for excessively green patches in the bales dry slowly and moulds may develop.

There are no reliable instruments to measure the moisture content of the hay quickly, and one must rely upon experience in judging the time to bale. Fortunately there is a fairly wide margin of error, and in practice one can assess the time to start baling quite accurately. The hay should be about half made, and the baling should be done as loosely as possible so that the air can get through. With 45 per cent moisture the standard-sized bale is very heavy. This difficulty can be overcome by making half-sized bales, but these are awkward to pack into the drier and the air tends to get between them rather too easily. Many modern balers can produce bales of intermediate size, and a length of about 30 inches is often convenient.

Packing the drier

The sides round the floor of the drier should be blanked off, either permanently or with a half width of felt, to prevent air blowing up the sides. When the bales are packed into the drier they should be laid on edge, with the cut sides downwards, and alternate layers should be crossed. Any gaps should be packed tightly with broken bales.

If the hay is loaded into the drier loose it should be tedded out carefully from a loading platform; treading on the hay must be avoided. When the loose hay is about eight feet deep, drying should start, but more can be added once the first layer is nearly dry. Baled hay should not be stacked more than six bales deep. Five deep is better, but if it is necessary to put in six layers it may be desirable to unload before the top layer is dry, and put it into the bottom of the next batch.

If the weather breaks and one is using cold air, it may be advisable to switch off the fan during the night when the humidity is highest, but this cannot be done for too long at a time, otherwise the hay will heat and losses due to bacterial action will be accelerated. Two or three days of drying with cold air takes one to the third stage of drying; that is, when heat may usefully be introduced to finish off the process. A rise in temperature of 10–20°F

makes the air dry enough to bring the moisture content down to a safe level in about 48 hours, without wasting heat.

The right moment for switching off the fan and unloading or adding further layers is not easy to assess, for although one can thrust the hand into the bales and judge the degree of dryness it is easy to miss wet patches. Probably the easiest way in practice is to feel the insides of the bales and, if this check is satisfactory, switch off the fan and leave for a few hours. If when the fan is re-started steam rises from the top of the bales, the hay is not completely dry and the fan should be left running for a further twelve hours.

Advantages even in dry weather

The advantages of a barn drier are obvious in wet weather, but few critical trials have been made to compare the relative costs and feeding value of barn dried and field cured hays. In a trial carried out at Great House Experimental Husbandry Farm, the extra labour involved in carting the additional weight to the drier, unloading, and re-stacking the bales from the drier were slightly less than the additional labour used in the extra tedding of the field cured crop. This was under favourable weather conditions, and the difference in favour of the barn dried hay would have been greater in bad weather. Losses of dry matter in the hay after placing in the drier amounted to 4·5 per cent, whereas hay made in the field lost 15·8 per cent of its dry matter between stacking and feeding. At Drayton Experimental Husbandry Farm, where the losses in the field were also measured, there was a total saving of 18 per cent dry matter in 1958 when barn dried hay was compared with field cured. Savings of this order can fully cover the total costs of barn drying. Digestibility trials are in progress to compare the feeding of hays made in barn driers.

Barn hay drying in this country has progressed rather slowly. This is probably due to the rather laborious method of hand spreading which was originally recommended, and the slow rate of drying experienced when using only cold air. Now that the process can be mechanized and the value of supplementary heat is appreciated, the practice will probably spread rapidly.

Cereal Deficiency Payments in 1960–61

Growers who have not received a claim form for their deficiency payments should apply at once to the Ministry's nearest Divisional Office. Claim forms must be returned to Divisional Offices by 31st July 1960 to qualify for payment.

Potato Root Eelworm* under Glass

A Survey of Nurseries in Glamorgan and Monmouthshire

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IN the winter months of 1954–55 and 1955–56, soil samples were taken from 119 holdings in Glamorgan and Monmouthshire, to find the distribution of potato root eelworm under glass, and how it was related to other soil factors; 857 houses were sampled, covering a total area of 41 acres, of which 30 acres were devoted to tomatoes. These included all commercial holdings having over 6,000 sq. feet of glass and many smaller nurseries producing marketable crops.

Samples were taken with a one-inch "cheese corer" to a depth of eight inches. Approximately thirty cores were taken from each house or section of a house, and bulked, air dried and thoroughly mixed before being divided into two portions, one of which was subjected to chemical analysis. Potato root eelworm cysts were recovered by flotation of 100 grammes from the remainder. Total numbers of cysts were counted and, if less than ten were present, each cyst was dissected separately and placed in one of three categories—empty; 1 to 50 eggs; over 50 eggs. When large numbers of cysts were recovered the numbers of larvae present were estimated by aliquot methods.[1] All the figures quoted for larvae and cyst levels refer to the population in one gramme of air dried soil.

The chemical analysis gave values for acidity, phosphate, potash and organic content, and concentration of soluble salts expressed as the concentration potential (pC). The standard of cultivation and condition of houses were also noted. For statistical analysis these results were classified as indicated in the tables, and the numbers of houses at four levels of eelworm infestation were set out in contingency tables and analysed by the x^2 test, classes being grouped together where necessary.

Distribution of the eelworm

The levels of eelworm infestation were grouped into four main classes, 0, 1 to 20, 20 to 50 and over 50 larvae per gramme, basing the levels on the assumption that over 20 larvae would produce a reduction in crop, and that severe symptoms might occur when over 50 larvae were present. The number and percentage of houses infested at the four levels is given in Table 1. In terms of total cysts per gramme, 3 per cent contained over 2, 14 per cent over 0·5 and 29 per cent 0·001 to 0·5 cysts. No cysts were found in 57 per cent of the samples. The number of houses infested (43 per cent) was slightly higher than that recorded by Stone[2] in a survey of glasshouses in Somerset.

* *Heterodera rostochiensis Woll.*

When the holdings were grouped according to size (Table 1) it was found that the number of uninfested houses in holdings of over 40,000 sq. feet was significantly large. Only nine nurseries in the two counties fell into this group, and the highest level of infestation on them was under 20 larvae per gramme.

Table 1

Distribution of infestations according to size of holding

Size of holding *sq. feet*	Eelworm infestation (larvae per gramme) *0*	*below 20*	*20–50*	*over 50*	Total number of houses
	per cent of houses				
Over 40,000	76	23	0	0	146
15,000 to 40,000	61	25	7	7	155
6,000 to 15,000	47	42	5	6	200
Below 6,000	53	32	8	7	356
Per cent of total houses	57	32	6	5	

Relationship with chemical factors

Ninety-seven per cent of the soils analysed contained a high level of phosphates. Potash levels were also high or medium, and showed no significant relationship with eelworm populations. In general the relationship between presence and absence of eelworm and pH was not significant, but a comparison of houses with 0 and below 20 larvae with those with over 20 gave a slight indication that the higher populations occurred more frequently than expected in slightly alkaline soils (pH 7·01 to 7·5) (Table 2).

Table 2

Distribution of eelworm infestations at five values of pH

pH	Eelworm infestation (larvae per gramme) *0 to under 20*	*over 20*	Total number of houses
	per cent of houses		
5–5·8	87	13	70
5·81–6·5	90	9	209
6·51–7·0	91	9	269
7·01–7·5	84	16	245
over 7·5	87	13	54

Low organic matter was recorded in only one house, which was not included in the analysis. An examination of the incidence of eelworm infestation at three levels, 0, below 20 and over 20 in soils with satisfactory and medium organic content, was significant because of the low number of houses containing over 20 larvae in the latter group (Table 3). The presence and absence of eelworms examined at four levels of soluble salt concentration was also significant; the number of infested houses with a high concentration (pC 2·8 to 2·6) being large (Table 4).

These figures were re-examined at the four levels of soluble salt concentration, considering soils with satisfactory and medium organic content separately. A significant relationship was found at the satisfactory organic level, due to the large number of houses in which the soluble salt concentration was high and the eelworm population below 20 larvae per gramme (Table 5). No significance was found in soils with a moderate organic content.

Table 3

Distribution of eelworm infestation in soils of medium and satisfactory organic content

Organic content	Eelworm infestation (larvae per gramme) *0*	*below 20*	*over 20*	Total number of houses
	per cent of houses			
Satisfactory (over 6 per cent)	55	32	13	701
Medium (3 to 6 per cent)	66	27	7	113

Table 4

Distribution of eelworm infestation at four levels of soluble salt concentration

Soluble salt concentration (pC)	Eelworm infestation (larvae per gramme) *0*	*infested*	*below 20*	*20–50*	*over 50*	Total number of houses
	per cent of houses					
Satisfactory (over 3)	58	42	30	6	6	294
Medium (3–2·8)	68	32	24	4	4	182
High (2·8–2·6)	50	50	39	6	5	236
Very high (2·6–0)	54	46	34	8	4	131

Table 5

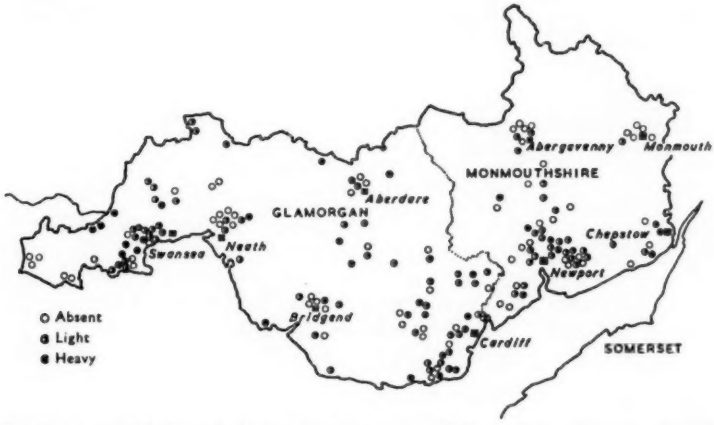
Distribution of eelworm infestation in soils with satisfactory organic content, at four levels of soluble salt concentration

Soluble salt concentration (pC)	Eelworm infestation (larvae per gramme) *0*	*below 20*	*over 20*	Total number of houses
	per cent of houses			
Satisfactory (over 3)	57	30	13	230
Medium (3–2·8)	66	25	9	145
High (2·8–2·6)	48	39	12	205
Very high (2·6–0)	53	33	14	117

Effect of cultural conditions

In view of the effects of standard of cultivation and the general condition of the glasshouses on the growth of tomato plants, and therefore, indirectly, on the eelworm population, an attempt was made to grade nurseries into those where conditions were good, moderate or poor. The distribution of levels of eelworm populations in these categories was examined, and it was found that the number having a population of over 20 larvae per gramme was low where the standard of cultivation was good and high where the condition of houses was poor.

The map shows the distribution of nurseries where glasshouses were moderately and heavily infested (over 20 larvae per gramme); lightly infested (below 20 larvae per gramme) and those where no potato root eelworm



Distribution of light infestations of eelworm (below 20 larvae per gramme) and of moderate or heavy infestations (over 20 larvae per gramme).

cysts were found. The heavier infestations occurred in the highly populated urban areas, particularly near the larger towns. Small and moderately sized nurseries in these areas were often established on or near old allotment sites used mainly for potato growing, and possibly infested with potato root eelworm before the glasshouses were built. The sites of large nurseries were previously farm lands, on which a wider rotation would be practised between potato crops, thus reducing the risk of infestation.

The highest percentage of houses free from eelworm was on nurseries of over 15,000 sq. feet. Few of these nurseries had been steam sterilized in recent years but, in several, flowers formed the main crops with tomatoes planted as a summer "catch crop". Thus the cultural practice would help to keep the eelworm population at a low level. This was also reflected in the low incidence of infestations of over 20 larvae per gramme in nurseries where the standard of cultivation was good; conversely, populations of over 20 larvae per gramme occurred frequently in nurseries where houses were in poor condition, usually due to age.

A high phosphate and potash content appeared to be characteristic of most houses in the area, and their effect on root production and consequently eelworm infestation was not a significant factor in this survey. There was some evidence that populations of over 20 larvae per gramme occurred more frequently in alkaline soils than in neutral or acid conditions. This agrees with the findings of Simon[3] in a survey of the incidence of sugar beet eelworm in Belgium, and with those of Carrol[4] recording potato root eelworm in soils of pH 7 and above.

Indications of a relationship with population levels were found in the case of organic content and soluble salt concentration. One would expect higher organic content to result in the production of larger root systems, which would support more eelworm cysts. This is borne out by figures obtained in the survey, where high populations were found less frequently in soils of medium organic content. It may be, however, that additional organic matter was applied to heavily-invested soils in an effort to increase yield.

The incidence of eelworm was high in soils containing a high concentration of soluble salts (pC 2·6 to 2·8), considered at all levels of organic matter (Table 4) and at a satisfactory level only (Table 5). The high salt concentration represents the level of tolerance for tomatoes[5] and could therefore be expected to have an adverse effect on the plant. There was no indication that a more satisfactory salt concentration, with the resulting improvement in growth, also increased the eelworm content. It may be deduced that the combination of eelworm infestation and high salt concentrations in the same houses is a reflection of poor cultural practice rather than an association between the two factors.

This survey was conducted by the staff of the Entomology Department, National Agricultural Advisory Service, Cardiff and the Horticultural Officers in the counties of Glamorgan and Monmouth. The assistance of the staff of the Chemistry Department with the chemical analyses, and of Mr. C. R. Gregory, who initiated the survey, is gratefully acknowledged.

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3rd June Agricultural Census

When you receive your June return, please fill it in quickly and post it back to the Ministry—within seven days.

Wire Floors for Layers

DAVID WATKINSON
Lacock, Wilts

Mr. Watkinson describes the operation of a very advanced design of windowless, wire-floored laying house, with complete control of light and ventilation and an up-to-date automatic feeding unit.

SLATTED or wire floors have been used for laying stock in small outdoor units and cages for a long time, but it is only during the last few years that they have been used for housing large flocks intensively. I will describe the layout and management of such a unit, using wire floors, which I prefer to slats, and then discuss the implications of this system.

The house is very similar to a windowless broiler house, though with an eaves height of 7½ feet. The lower part of the walling is of concrete blocks, to form the droppings pit, with hollow insulation blocks above. The roof is double skinned aluminium, with 1 inch of fibreglass and 4 inches air space between.

Of the 6,400 sq. feet of floor area, 480 sq. feet are taken up by a centrally placed feed and egg store which divides the house into two pens. These pens are further sub-divided by a 3-feet-wide egg-collecting passage running the length of the house.

The floors of the pens are completely covered with galvanized welded mesh in 12 feet × 6 feet sections, supported by bearers at 12-feet centres 2 feet 9 inches above ground level. The floors of the central service area and egg-collecting passages are concreted; the area under the weldmesh is of earth. Each section holds 1,250 birds (5,000 for the complete house), giving a stocking rate of just under 1 sq. foot of mesh per bird.

Labour saving throughout

Feed is supplied by a two-line automatic chain feeder, water by 6-feet fox-valve drinkers, and grit in hanging tube feeders. The nest-boxes, which are of a communal roll-away type, are fixed down each side of the egg-collecting passages forming part of the pen walls.

Light is supplied by ordinary tungsten filament bulbs—six 100-watt bulbs to a pen. A standby electricity supply is available.

The pullets are debeaked once, usually at housing time, but sometimes this is done during the growing period, since it has the advantage of reducing the labour load when housing and avoids too serious a check when the birds are near laying.

Initially, the roll-away nests are strawed and, as one becomes popular, the straw is removed to encourage even laying in all the boxes. This is important as I have experienced considerable trouble with the birds all piling into one or two boxes, causing egg breakage, prolapse and even suffocation. Unfortunately, individual nests are difficult to darken and outbreaks of vent pecking can result.

Feeding is all mash, a fairly high energy battery mash giving a productive energy of 900 calories per lb and 16 per cent protein. The feeders are controlled by time switches which can be adjusted to fill the troughs every two hours or as required, depending on the length of day and consumption. The feeders have proved very satisfactory, with a minimum of waste, the constantly stirred food helping to prevent cannibalism.

The feeder hoppers, which are fixed in the central feed room, are filled daily by an auger. We shall be putting in larger feed hoppers soon, so that food may be handled in bulk. Oyster shell and granite grit are bought in 56-lb paper sacks, and these are emptied directly into the hanging tube feeders once a week.

Eggs are collected direct into trays from the roll-away nests, and a very high proportion are clean. Any soiled or damaged eggs are collected separately. The full trays are carried in piles to the egg room, where they are stacked for cooling. It is quicker and easier to carry the eggs rather than use a trolley, as the average distance is only 36 feet.

Broodies are largely ignored unless they become very numerous, when they are removed for breaking. In practice this only occurred for two weeks last summer.

Points to watch

The primary object of having a windowless house is to remove the possibility of the birds being disturbed from outside, to help insulation and to have the light applied exactly where and when it is required. There are also more experimental applications such as "stimulighting". While I am now convinced that windowless laying houses have a great advantage for units where management is good, there are quite a number of pitfalls. Birds are very sensitive to change in day length, and the failure of a time switch or other accident, if not spotted at once, can have disastrous results in a high-producing flock. Another point to watch with a windowless laying house—don't rear birds outside in midsummer when they are having a 17-hour day and then house them with a standard 14-hour day. Keep the day length much the same as they have had towards the end of their growing period.

Flies can be troublesome in the warmer months, though a weekly spraying with a microsol type mist generator when the lights are out gives a good control. Mite and similar insect infestations have not proved troublesome, but periodic use of a pest spray rather than a fly spray can help prevent any build-up.

Mechanical ventilation

Mechanical ventilation is vital, for apart from the very high stocking rate there is a certain amount of ammoniacal activity from the accumulated droppings. I have two variations, both giving a maximum air change rate of $4\frac{1}{2}$ cu. feet/bird/minute. One employs ridge-mounted extractor fans, with baffled and controllable inlets set down both sides of the house just beneath eaves level; the other has the inlets down one side of the house with the fans mounted on the opposite wall. The latter set-up has the disadvantage of a

rather large temperature gradient across the house with low fan speeds. In both cases the fans are speed controlled and wired to thermostats. These are set to cut out the fans at 50°F, and in practice the temperature in the houses has never dropped below 48°F.

No culling is practised at all, as it is found that the disturbance to the birds and labour cost far outweigh any advantages. I feel that if the laying season were to be extended to 14 months it would be worth while going through the flock at the end of the tenth month.

At the annual clean-out, all the fittings and the floor panels are removed, and the accumulated droppings shovelled out with a tractor-mounted loader. It is a great help to have the bucket on the loader as wide as, or wider than, the tractor wheels, since this avoids too much hand-work.

It was originally intended to have the feeders and drinkers hung from the roof, but this idea was abandoned in favour of standing them on the floor to avoid the possibility of their swinging about and frightening the birds.

Results have been most encouraging, with a hen-housed average of about 230 eggs in a 48–50-week laying period, mortality of the order of 1 per cent per month, and a food conversion rather better than the same strain in the 500 day random sample tests. These are average results over seven pens, both spring and autumn hatched.

Pointers to success

For success with a wire-floored laying unit the following points should be noted:

1. Use a modern high speed layer—there are two well-proved strains available, and others making their appearance.
2. A well-insulated and ventilated house, preferably without windows.
3. Wasteproof feeding—food and water spread over the whole floor area, so that no bird can be more than 6 feet from either.
4. Dark and attractive nests with a fair proportion at floor level. Avoid littered nests if possible, as they encourage broodiness and the litter has constantly to be replaced.
5. Have a standby electricity supply in case of power cuts.

A unit such as I have described should cost approximately £1 per bird, including all wiring, foundations, water supply and food store. I don't believe the system is economical with units smaller than 2,000 birds. For smaller units I would prefer Californian type cages.

One man with part-time help for egg collecting can easily manage 10–15,000 layers, except for the annual clean-out. Because of the density of populations, stress factors may adversely affect intensive production more than under any other system of management. Added to this is the fact that machinery, however well constructed, cannot always run trouble free. The need is for an operator who is a good stockman and who has some mechanical aptitude. Given this, there is no reason why profit per bird in a wire-floored house should not be as good as, or better than, that under any of the more conventional systems.

Photo: *William Morris*

The stocking rate in this wire-floored house is just under 1 sq. foot per bird.

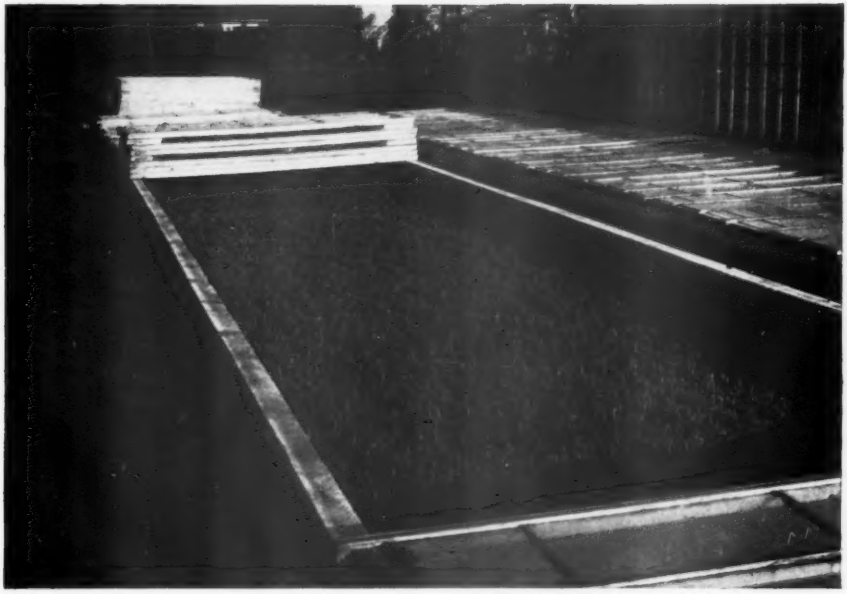
Photo: *William Morris*

Eggs are collected direct into trays from the roll-away nests, and a very high proportion are clean.

A tomato plant in good balance, and throwing a normal truss, on 8th February. With the aid of mercury vapour lighting, it produced ripe fruit in the middle of April, in Lancashire.

Photos: *North Western Electricity Board*

Germination testing in progress on seeds at a commercial trial ground.



One of sixteen electrically heated frames at a nursery in Lancashire, showing chrysanthemum stools being overwintered.

Photos: *North Western Electricity Board*

To meet the increased demand for electricity as a direct aid to glasshouse cropping, the North Western Electricity Board has installed transformers and switchgear on or near ten nurseries in its area.

A district in Wairarapa. This is typical of the hill country which has benefited most from aerial top dressing in New Zealand.

Photos: *High Commissioner for New Zealand*

A Hawkes Bay farm. This is not altogether typical of farms in the North Island; there would usually be fewer buildings.

By Grass Alone

Farming in the North Island of New Zealand

A. TROUGHTON,* M.Sc., PH.D.

Welsh Plant Breeding Station, Aberystwyth

For a number of years it has been customary to cite New Zealand farming techniques and practice as an example of what it is possible to achieve by using grass alone. But emphasis has not always been placed on the background to these practices nor upon the New Zealand farming systems in their entirety.

THE high production figures quoted in the descriptions of New Zealand farming practices almost always concern the North Island, which is about the same size as England and Wales and is nearer the equator. As may be expected, the climate of the North Island of New Zealand is considerably warmer than that of England and Wales, but the difference is not so marked in summer as in the colder months (see Table 1 on p. 136). New Zealand has more sunshine, especially during the season of short daylength. Both countries have adequate rainfall, well distributed throughout the year, and in New Zealand it falls with the tropical intensity of very heavy showers, days of drizzle and mist being uncommon.

The differences in climate are reflected in the seasonal distribution of the growth of grass throughout the year (Table 2). In New Zealand, grassland produces 19 per cent of its annual yield in the autumn, while in England in the same period it produces only 4 per cent. The comparable figures for winter are 14 per cent and none respectively. A New Zealand farmer can rely on grass all the year round, sufficient for maintenance in autumn and winter, and for production in the spring and summer.

The farming which has developed around this growth of grass is by British standards extremely simple. There are two systems, dairying and sheep grazing: the dairying is on the good lowlands, and the sheep farming extends from the poor lowlands into the hills well above the 1,000 feet contour. The two systems are rarely found on the same farm, each farmer specializing in one or the other.

Virtually only one breed of dairy cow is kept, the Jersey; cows calve in the spring and are machine-milked in a fixed bail until the autumn, when they are dried off. During the winter they are kept outside, and in cold weather each animal is covered with a canvas coat similar to a horse rug. The milk is sold for manufacturing purposes, butter and cheese being the main products. Payment is made usually on a butterfat basis; this explains the choice of breed.

The details of the sheep farming are equally simple, although they vary with the quality and topography of the land. On the lowlands, the ewes lamb early in spring, and the lambs are sold off fat in the autumn. Lambs may also be bought from the hill lands for fattening. As the altitude increases, less

* Dr. Troughton undertook research in New Zealand at the Plant Physiology Unit, Grasslands Division, D.S.I.R., Palmerston North, during the year 1958–9.

emphasis is placed on fattening and more on the selling of stores and wool. On the high hills no lambs will be fattened, and only store and draft ewes sold. The universal breed, both on the hills and on the lowlands, is the Romney Marsh. The only exception of importance is the Southdown, which is crossed on to Romney ewes on the first-class lowland to produce prime quality fat lamb.

Table 1

Comparison of the climate of the North Island of New Zealand with that of England and Wales: average of four stations in each country

RAINFALL	Inches per year	Percentage falling in *Spring*	*Summer*	*Autumn*	*Winter*
North Island, New Zealand	43·4	22	22	29	27
England and Wales	31·0	21	27	30	22
SUNSHINE	Hours per year	Percentage recorded in *Spring*	*Summer*	*Autumn*	*Winter*
North Island, New Zealand	2,091	29	30	20	21
England and Wales	1,488	36	33	14	17
TEMPERATURE (°F)	Average for the year	Average for *Spring*	*Summer*	*Autumn*	*Winter*
North Island, New Zealand	56·1	59	64	53	49
England and Wales	49·1	52	59	45	41

New Zealand stations: Palmerston North, Gisborne, Rotorua and Auckland. Mean height above sea level 304 feet.

England and Wales stations: Cockle Park, Cambridge, Southampton and Aberystwyth. Mean height above sea level 221 feet.

Table 2

Seasonal pasture production as a percentage of annual production

	Spring	*Summer*	*Autumn*	*Winter*
North Island, New Zealand	37	30	19	14
England	56	40	4	0

Dairying and sheep farming are based almost entirely on grass. The proportion of arable to the total agricultural land is extremely small—about 3 per cent compared with the 26 per cent of England and Wales. Both systems are also based on the animals harvesting the grass themselves throughout the whole of the year. Only about 5 per cent of the grassland is cut for hay or silage. An increase of this area, especially on dairy farms, would probably result in greater production through the improvement of pre-lactation nutrition.

Not all the grassland is of the famed perennial ryegrass and white clover variety. In fact only about 1–2 per cent is of this composition, and only 24 per cent would be rated botanically as good pasture. These figures are very like the proportions of similar pasture in England and Wales, which are 1–2 per cent and 26 per cent respectively. The high productivity of the

New Zealand pastures is not therefore due to any inherent quality of the sward, but to the milder climate and better management. A tussocky field carrying half a hay crop is a very unusual sight in New Zealand, but all too common in England and Wales. A New Zealand farmer believes in eating his grass as it grows, grazing it hard and clean; a sheep farmer would consider a rotationally-grazed pasture ready for stocking when his English counterpart would be taking his sheep off.

To achieve this control of the pastures, very high stocking rates are used. On a sheep farm the stock concentration will vary with the quality of the land, and up to eight ewes with lambs per acre can be maintained; on a dairy farm the usual stocking is one cow per acre. Aberdeen-Angus cattle, either cows suckling calves or fattening beasts, are kept on sheep farms to eat down the rough herbage left by the sheep; usually one beast for every three to eight acres. These cattle are managed purely for the benefit of the sheep, and are not expected to contribute to any great extent to the profit account. It is interesting to note that a breed considered in the United Kingdom to be primarily suited to stall feeding, but producing a first-rate carcass, is used in preference to one better suited to the hard grazing but producing poorer quality meat.

The actual day-to-day management of the grazing animals varies from farm to farm, depending upon the district and the farmer's personal preference. The alternative methods of management on sheep farms are set-stocking and rotational grazing, whilst on dairy farms there is also the choice of strip grazing. Rotational and strip grazing, combined with the effective conservation of herbage not needed immediately, give the greatest production per acre, but not necessarily per man.

Regular phosphate dressing essential

Regular manuring with phosphates is essential to New Zealand grasslands if they are not to degenerate; dairy pastures usually receive 2–3 cwt per acre each year, and the sheep pastures the same quantities at rather longer intervals. Nitrogenous fertilizers are used sparingly, as the New Zealand farmer prefers to rely on white clover for his nitrogen, not because of any belief in the inherent superiority of this plant but because of the high cost of nitrogenous fertilizers. He realizes, however, that not only does clover supply grasses with nitrogen by underground transfer, but when properly managed it also supplies the animal with large quantities of protein, much of which is returned to the pasture in the form of nitrogenous excreta after serving its primary purpose, which is the nutrition of the animal. The importance of white clover to the New Zealand farmer is well illustrated by the yield of grass and clover, separately and together, at Palmerston North; perennial ryegrass yielded 2,000 lb of dry matter per acre, white clover 9,000 lb, while when combined they yielded between 11,000 and 14,000 lb. Apart from phosphate, lime is the only fertilizer regularly used, but the area receiving lime each year is only about half of that getting phosphate.

After the second World War the development of aircraft capable of spreading superphosphate cheaply over rugged and inaccessible country has virtually saved many acres in the New Zealand hills from extinction as agricultural land. The natural vegetation is thick, semi-tropical, evergreen forest,

which the pioneers in the last century cut down and burned before sowing the seeds of European grasses. These grew well until the fertility provided by the ashes of the forest began to be exhausted. On the rolling plains of the lowlands this lost fertility could be replaced easily with artificial fertilizers, especially superphosphate. It was an entirely different story on the steep, gully-divided hills, where the rocks are soft and even small streams will quickly cut a steep-sided valley, producing a landscape of ruggedness unknown in this country. Roads along which fertilizers could be conveyed are few, the only practicable means of transport in many places being the backs of horses and men. On the hill, the only means of spreading fertilizers was by hand, an almost impossible task both physically and economically. Gradually a lot of this land started to revert to scrub of the most tenacious type. Farms tended to get larger as the stock-carrying capacity decreased and families left the hills. Mute evidence of this can be seen in the fields where daffodils and *Arum* lilies grow wild in the centre of a paddock, showing where a garden surrounding a homestead had formerly been. Aerial top dressing has provided the answer. In 1949–50 some 5,000 tons of fertilizer were spread by this means, and in 1955–56 the figure had increased to 400,000 tons. Aerial top dressing does not in itself provide the means of reclaiming land already covered with scrub, but it does provide a method of maintaining production on land not so covered, and thus gives an incentive to reclaim scrub.

Few farm buildings

It is not, however, details of the farming systems that immediately impress a visitor from England, but the homesteads and farm buildings, or rather the lack of them. The great majority of the houses in both town and country are wooden-framed bungalows with wooden walls and corrugated iron roofs, the whole house being painted in gay contrasting colours. In one suburban street it was not uncommon to see houses with roofs painted black, red, blue, lemon, grey and green, some clashing and some harmonizing with the surrounding roofs of their neighbours. The modern houses, however, are a housewife's dream, being largely of the type known in England through the pages of women's magazines. Electricity is used for every possible purpose; it is extremely cheap, and is available on all except a few of the most remote farms, but even these usually have their own private generating plant. The farmhouses are usually isolated in the centre of the fields; the only other building on the farm is either the wool shed or the milking bail, and it may be set at some distance from the house.

There are few villages such as are found all over Britain, the rural population not living on farms tending to congregate into small towns. These can offer better facilities for shopping, banking and entertainment than villages. This distribution is largely a reflection of the labour organization of the farming system. Few people, other than those actually living in the farmhouse, work regularly on a farm. The extremely high cost of labour makes it economically impossible to employ men unless they are working to full capacity all the time. The farmer will therefore do the routine jobs of shepherding, milking, etc., himself, but will employ mobile gangs or contractors for seasonal work such as shearing or work he cannot tackle un-

aided, for example aerial top dressing and the renewing of fences. The farms are large by British standards, so that the farmer is very fully employed on routine tasks. A dairy farm will usually be between 50 and 100 acres, with as many cows, and a sheep farm will have about 1,000 ewes. The standard of living in New Zealand is high, and if the farms were not large the standard among the farmers would fall below that of the rest of the population. It is chiefly because of the high standard of living that labour is extremely expensive and the New Zealand farmer has had to adopt every possible labour-saving device.

The future of these systems of farming is at present giving rise to very considerable concern. Difficulty is being encountered in selling produce at economic prices, especially from the dairy farm, and with increased production in New Zealand and other countries this problem is liable to become acute. If it is to be avoided, either new markets for present products must be found or other goods offered for sale. Many New Zealanders are hopeful that the expanding industrialization of Australia will result in an increased market for their commodities, especially dairy products.

The widening of the range of goods offered for sale would have to come from an alteration in the farming system. It is difficult to visualize any change which would not involve an increase in the acreage of arable land. Even if the New Zealanders do not change from their present dairy products, the level of productivity could no doubt be raised by adding to the acreage under forage crops or under grass consumed for winter feeding. As all the grassland is in permanent leys, a suitable rotation would no doubt be thought by some to provide a way of augmenting the arable acreage without decreasing the output from the grassland. With the present high cost of labour, it is very doubtful if this would be an economic proposition. If a profitable cash crop could be incorporated into the rotation, it would probably be worth while. At present, however, there is a very limited outlet for any cash crops. The population of the country is so small that enough potatoes, fresh vegetables and flowers are adequately supplied by a few specialist producers.

Strength and weakness of simplicity

The simplification of the farming systems and the lack of diversity are at once New Zealand's agricultural strength and economic weakness. Agriculturally the food requirements of the animals vary throughout the year in the same manner as the rate of growth of the grass, so that there is little need for conservation, or for the purchase of feedingstuffs. Each farmer is dealing with only one crop, grass, one species of animal and one or two products from that animal. He can become a specialist and devote the whole of his skill to few matters. The use of only one breed of each species greatly simplifies marketing, and enables large quantities of a uniform product to be offered to the buyer. Economically, the system is weak because the whole structure is founded on the world price of four products (butter, cheese, wool and meat) and consequently is very sensitive to changes in world trade.

The British farmer has the opposite advantages and disadvantages. His numerous products buffer him to a great extent from the changes in the world markets, but they demand that he should be skilled in many arts, not

allowing him to devote himself to one or two products and thus greatly increasing his difficulties of marketing. As the complexity of the farming increases it becomes more difficult to meet the animals' need for food throughout the year from that provided by the environment. The British farmer is, therefore, more dependent upon conserved fodder and bought concentrates.

Could British farming be simplified, without sacrificing the advantages of diversity? For example New Zealand manages with one breed of sheep and one cross, while a standard British textbook lists thirty-two British breeds. Each occupies its own ecological niche, and therefore full use is made of the advantages of each environment—or so the multi-breed protagonists maintain. It seems very debatable whether the extra production gained by having a breed for each environment outweighs the difficulties of marketing an almost infinitely variable product. The uniformity of New Zealand products on the British market reflects the uniformity of their farming systems.

The South Island of New Zealand has not been taken into account in this paper, although in certain areas the farming there resembles that of the North Island, but under colder conditions. Much of the South Island is, however, clothed with forest on the wet, west side, and with poor, natural tussock grassland on the dry, east side. Most of the east side is subject to severe drought, which limits its agricultural productivity and makes comparison with British conditions difficult.

Mead

RALPH WHITLOCK

THERE seems to be something of a revival of interest in mead. Several commercial firms have started producing it, and many amateur wine-makers would like to try their hand at it if only they could find out how to set about it. Basically, it is a fermented mixture of honey and water.

From time immemorial until the Tudor period at least, mead was made and drunk in prodigious quantities. The monks of Abingdon, for example, were allowed 15 pints between six of them for dinner and 15 pints between twelve of them for supper. It is on record that during a water shortage in the eleventh century a fire at the German town of Meissen was put out by pouring barrels of mead over it. We read, too, of a Norse King, one Fjolne, who constructed "a great vessel, many ells high, and put together of great pieces of timber; this vessel, which stood in a lower room, was full of mead which was excessively strong". King Fjolne, wandering from his room in the middle of the night and being "very sleepy and exceedingly drunk", fell into the mead and was drowned!

All this is not surprising when we remember the importance of honey in the days before the introduction of sugar. With bee-wards in every settlement and manor, spending their whole time attending numerous stocks of

bees, we can well understand that a drink made from honey was bound to be in favour.

Several reasons have been advanced for the decline of mead-making and mead drinking. One, concerning England alone, is that during the Middle Ages, when our monarchs ruled also over large areas of France, French wine was very much cheaper than home-made mead. Another, that the Reformation decreased so considerably the quantity of beeswax candles required for religious use that many beekeepers either went out of business or considerably reduced the numbers of their hives. Undoubtedly, too, the development of the use of sugar-cane and later of sugar beet had much to do with it, but perhaps as significant as anything was the invention of the modern hive.

With honey to hand

The old system of beekeeping, by which the comb was destroyed in autumn, provided beekeepers with masses of an unsaleable mixture of comb and honey, remaining after the first extractions had been made. What simpler than to soak the wax in water, thus providing the basic material for mead? Now, of course, the cells are uncapped, the honey removed and the comb replaced for further use. The colony survives and faces the next summer with half its work already done, but the mead-maker has no sticky, honey-soaked wax from which to prepare his potent drink.

Some beekeepers do, however, make the sacrifice, and still others use the extracted honey, even imported. As a matter of fact, one of the difficulties in making mead is to obtain a level consignment of honey. English honey, deriving from small apiaries and gathered from a wide variety of flowers, varies considerably, whereas some imported honey is much more uniform. Clover honey is excellent, but most types of honey, even heather honey, can be used. The other ingredients are water (soft rather than hard) and yeast.

Most failures are traceable to using the wrong yeast, of which there are innumerable varieties. Use cultured wine yeasts, say the experts, and give a swamping charge to keep out other yeasts. The best advice is to apply to Long Ashton Research Station, which produces master-cultures for distribution to people all over the country who will breed and distribute them.

Mr. A. G. Harrison, of Callington, Cornwall, who is a noted mead-maker, gave me his method as follows: use clean rainwater, boiled and then allowed to cool to 120°F. At the same time heat the honey to 100°F. Then pour the honey into the water, stirring with a sterile wooden rod, and allow the mixture to cool to 65°F. Pour in the yeast. Allow the yeast to grow in air for a time and then cut off the supply of oxygen. The mead is drinkable at four to six months, but it is incomparably better after four years!

To amplify, the mixture should be placed in a clean cask or jar and kept, for the first stage, in a warm room. Fermentation will soon begin and cause froth to collect on the top. Keep the cask filled by adding more honey-water, but when the froth ceases to form insert an air-lock. Take the container out of the warm room and store in a cold place for three or four weeks after fermentation has ended. Then siphon off the mead into a clean cask, taking care not to disturb the deposit of yeast. Seal the cask with wax and store for a minimum of four months. Then siphon off the mead again into bottles and store, with the bottles laid on their side, in a cool place until required.

The best date for starting mead-making, says Mr. Harrison, is St. Bartholomew's Day (24th August), but a little latitude may be allowed, extending into September and October.

So much for the straightforward method of making mead; but there are refinements and variations. The mead created from clover and other mild-flavoured honey is a dry drink. If a sweet mead is required, use heather honey, employing the same method, but leave bottled for a few years.

As with wine, you may, if you wish, produce a sparkling mead. At the stage when the mead is transferred from the cask to bottles (namely, after it has been stored for about six months), reinforce it with honey-water. This is prepared by mixing 8 oz of honey and 1 pint of water and adding this to the mead at the rate of about ¼ pint per gallon. Strong bottles and strongly-wired corks are needed after this operation.

Other honey drinks

In addition to the varieties of mead, there is a whole range of similar drinks much appreciated and widely used by our ancestors but now little known. Some of them were as follows:

Metheglin: made of honey and water, and flavoured with herbs.
Cyser: made of honey, water and apple juice.
Melomel: made of honey, water and grape juice.
Pyment: a mixture of honey and wine.
Hippocras: similar to pyment but a proportion of the honey is replaced by sugar, and spices are often added. When further reinforced by spirits, it comes to us in the form of one or more of those much-advertised French proprietary drinks!
Bracket: a mixture of honey and ale.
Birch wine: (by one method at any rate) a mixture of honey and birch juice.

Various types of brandy are also made from mead or one of these other concoctions by the familiar process of distilling, and some famous liqueurs have a similar basis. Maraschino, for example, is made from honey, peach stones and the stones of the Marasca cherry.

In making metheglin, the usual procedure is to simmer the herbs in the water before adding the honey. Thyme, marjoram, clary, sage, fennel and mint are some of the herbs that may be used. In one type of metheglin only ginger and hops are included; another includes four or five herbs as well as cinnamon, ginger and cloves. The variations are endless.

Refinements include the addition of a dash of lemon juice to meads intended for show. This improves their acidity, as does a sliver of lemon peel in the honey-water used in making sparkling mead. I have heard, too, that the astringency of mead can be improved by adding a little Indian tea.

Alternatives to Anemones

J. L. BEDDALL, N.D.H.

County Horticultural Advisory Officer, Devon

Anemones have long been an important crop in south-west England. Mr. Beddall discusses the alternatives, including polyanthus, ranunculus, wallflowers and more specialist crops such as gerberas.

FOR over twenty-five years the anemone crop has played an important part in the economy of many growers in the south west. The long flowering period, from August to May, depending on the date of planting, has provided a useful source of income during the autumn and winter months. Every year, from Devon, Cornwall and the sunny plots below the limestone crags of Cheddar, many thousand boxes of these flowers are sent all over England to bring bright colour to many a townsman's fog-bound home.

A good anemone crop can give a gross return of £800 per acre, or sometimes more, though the average is nearer £500. This return, from an outlay of £60 to £70 per acre on the Dutch corms, has tempted many growers to plant a larger area than good husbandry demands, especially on the smaller holdings, with the result that the soil-borne phase of the fungus downy mildew (*Peronospora ficariae*) has often built up to damaging proportions. This has resulted in early infection of the plants, with lack of vigour, and of course greatly reduced yields.

Many growers have been looking around for alternative crops, without much success. Few crops, if any, flower for as long as the anemone, and few can give such high returns for so moderate an outlay.

What are the possible alternatives? Daffodils and narcissi are again returning lower prices than in the past, and demand a high capital outlay on stock. It is among the cheaper crops, suitable for the milder south-western climate, that the answer may be found. Polyanthus, ranunculus, violets, wallflowers and Brompton stocks can be considered. And amongst others that are grown in smaller quantities are gerberas, Christmas roses, *Schizostylis* or Kaffir lily, *Myosotis* and *Calendula*. What are their possibilities, and what do they need to give a remunerative return?

Polyanthus

Polyanthus are perhaps the most promising alternative, for they flower from November to the end of April, pack and travel well, and can be raised reasonably cheaply from seed. The strain of seed is most important, the best being cheapest in the end, and it should contain a wide range of colours, including shades of blue. The American Pacific Hybrid strain have very large individual flowers and sturdy stems; so have some of the New Zealand and several of the English strains. There is very little to choose between the best, but cheaper stocks are often disappointing. Many established growers save their own seed, and split up the plants with the better colours and larger flowers.

Seed should be sown as soon as ripe in August or September or, with the help of slight heat, in January. It should be set thinly in seed trays, using John Innes potting compost No. 1. The young plants are pricked out into boxes or frames in the same compost as soon as they are large enough to handle, and grown on until ready for moving to their final flowering quarters in late spring, or early August in the case of the spring sown crop. They can be left down for two seasons.

Polyanthus prefer the heavier soils, plenty of organic matter and, if possible, some shade. Plants grown in the nutrition reference plots at Rosewarne Experimental Horticulture Station have shown the importance of dung and also of a good balance of phosphate and potash. They are usually planted nine to ten inches square, four rows to a bed and, if to be covered with barn cloches, in double rows.

Flowering will start in a mild November and continue until April. The bunches are round or fan-shaped, and made up with either six or twelve stems, depending on size of flower head. Each should contain a good mixture of balanced colours, with one blue shade if possible. The anemone box is the normal package used, holding twelve to eighteen bunches. With a good strain, the return from an acre can be as high as £800.

Ranunculus

The Claremont hybrid ranunculus have a wide range of vivid yellow, orange and red shades, as well as some of the more delicate tones. July planting of the corms, or claws, will produce flowers in September to December, and again from the new spring growth in late April right on to June. A second planting in September to early October will produce flowers from February to June. In June the plants can be lifted, and the claws cleaned to be planted again in the autumn.

Like polyanthus, ranunculus prefer the heavier soils, which must be well drained; but they will grow in lighter ones if well supplied with organic matter. Little is known about their manurial requirements, but there must be a balance of phosphates and potash with all flower crops.

Plants should be eight or nine inches apart, with fifteen to eighteen inches between the rows. The claws should be set four inches deep. Each plant may produce from twenty to thirty flowers in the season, so that the return per acre can be high, though the claws cost much more than anemone corms.

Violets

Violets, flowering from October to May, are another possibility, but the demand is limited today, and the high cost of picking rather restricts their use on all but the family holding. Planting is normally carried out in April with selected runners rooted during the winter, or with runners from the flowering plants. Planting distances are normally eighteen inches each way, or, if planted in beds of four rows, fifteen inches apart. The stronger-growing varieties may need wider spacing.

The main varieties used are Princess of Wales, large and sweetly scented; Tina Whitaker—the largest and most sweetly scented; Pamela Zambra (or Bournemouth Gem); and the scentless Governor Herrick. Violets again like

plenty of dung, or a good balance of phosphates and potash, as results at Rosewarne have shown. They also demand soils with a pH of between 6·5 and 7·0.

Red spider mite has long been the chief pest of the violet, and was one of the causes of the decline in the acreage grown. The newer insecticides have changed all that; those containing demeton-methyl are perhaps the most suitable as they control aphids as well as the mite.

The flowers should be picked in the early morning, and only fully developed flowers should be taken; the others will not open. They are tied in round bunches, backed by a few large leaves. Packing is normally in anemone boxes, lined with white sulphite paper, which shows off the flowers to perfection.

Wallflowers

Many acres of wallflowers are grown each year in and around Dawlish. They are a cheap crop to produce, but returns can be low in some seasons. Only the early varieties are worth considering; for example, Phoenix—blood red, Early Flowering Yellow Phoenix, Early Fire King, Early Vulcan and Early Primrose.

Seed is sown in early April, and the plants transplanted in early June. Some growers sow direct in the field and thin out. Opinions differ on which gives the best results, but costs can be lowered by this direct sowing method. Wallflowers require soils with a pH of over 6·5, and again respond to dung, but little work has been done on their manurial requirements.

Flowering will begin in sheltered sites in late November and December, and continue until mid April. Picked into reasonable sized bunches they are normally packed in separate colours, but salesmen's requirements can differ. Returns can be as high as 2*s.* a bunch at Christmas, but can drop rapidly to a few pence in a glut.

Brompton stocks

Brompton stocks can be useful autumn and spring flowers, the flowering period depending on the sowing dates. Those sown in late May and planted out in mid-July will flower in the autumn; sowings in early July will flower from January onwards. The pinks, mauves and whites are in most demand. One hundred per cent doubles produce high quality flowers, and by their use a higher return can be obtained, as single flowers are useless. Stocks require a high lime status in the soil, and again a good balance of phosphate and potash is essential.

More specialist crops

So much for the probable alternatives; what are the other possibilities? Here we come to the more specialist crops, some of which demand a higher capital outlay to obtain a remunerative return.

Though normally looked upon as a cool-house plant, gerberas will flower outside in the mild south west right into the winter months. Damp is their chief enemy in winter, so protection in the form of cloches or Dutch light

frames is really essential, and this of course adds greatly to their costs of production.

Normally raised from seed, the plants vary greatly in their flowering capacity. Some produce only a dozen flowers in twelve months; others will produce forty. Vegetative propagation of these free-flowering plants is essential, and can be done by taking very small stem cuttings with a small piece of rhizome. Heat must be used for quick rooting in a sandy compost. Strain of seed is very important; some of the American strains are excellent, with large flowers of good, clean colours.

Around Christmas there is a limited demand for Christmas roses. The variety *Helleborus niger maximus*, which has a pure white flower, is the most suitable, but as the naming of these Hellebores is very confused it is advisable to see the stock in flower before buying. The plants prefer some shade, the heavier soils and plenty of dung if they are to flower freely. Once established, they need not be moved for several years. The use of a light framework covered with black cloth or black plastic will lengthen the stems and produce the whitest flowers. Returns can be high, and a few square yards frequently produces £10.

The Kaffir lilies (*Schizostylis*), with their pink gladiolus-like flowers, are another useful line on some of the Devon holdings. They flower from September right through until January. Propagated by divisions planted in April, they form large clumps in two years, and produce a dozen or more flowers in a season. They are heavy feeders and require manuring well.

For the cheaper lines, growers can consider using the hardy annuals such as *Myosotis*, *Calendula* and *Saponaria*. The variety of *Myosotis oblongata* "Blue Bird" flowers early in the spring, and can be a useful blue flower, though some protection by cloches increases its usefulness. Calendulas are hardy in the south west; they were in higher favour a few years ago, and could be considered again.

★ NEXT MONTH ★

Some articles of outstanding interest

FLOOD PROTECTION AND THE GREAT OUSE *by G. Cole*

PRESENTATION OF POTATOES FOR MARKET *by J. E. Piccaver*

HEAVY LAND FARMING *by M. H. R. Soper*

CELERY GROWING IN THE FENS *by K. M. Round*

Farming Cameo: Series 2

26. The Arreton Valley, I.O.W.

G. F. C. WHEELER, N.D.H.
County Horticultural Officer

THE downland road from Brading to Newport passes over Ashey Down close to an old sea mark on the summit, and from there on over the hills which form the northern boundary of the Arreton Valley, which is the main arable and market-gardening area in the Isle of Wight, comprising some 24 square miles of first quality land.

The Reverend Legh Richmond, who was appointed to the curacies of Brading and Yaverland in 1797, frequently visited this old mark, and wrote of the site and the valley below in his classic book "The Dairyman's Daughter": ". . . it was a lofty station, which commanded a complete circle of interesting objects to engage the spectator's attention. Southward the view was terminated by a long range of hills, at about six miles' distance. They met to the westward another chain of hills, of which the one whereon I sat formed a link, and the whole together nearly encompassed a rich and fruitful valley, filled with cornfields and pastures. Through this vale winded a small river for many miles: much cattle were feeding on its banks. Here and there lesser eminences arose in the valley: some covered with wood, others with corn or grass, and a few with heath or fern. One of these little hills was distinguished by a parish church at the top, presenting a striking feature in the landscape . . . Villages, churches, country seats, farmhouses, and cottages were scattered over every part of the southern valley . . ."

Such was the Arreton Valley in the last years of the eighteenth century. It has altered little since. The long range of hills to the south are the massive south downs of the Island, rising to nearly 800 feet at St. Boniface Down above Ventnor and sheltering the valley from the sea. The hills to the westward are the Chillerton and New Barn Downs, rising to 500 feet behind Rookley at their western extremity. To the west, the valley is roughly bordered by the road from Godshill to Blackwater through Rookley. To the east it is bounded by the sea between Culver Cliff and Shanklin. The small river to which Legh Richmond refers is the Eastern Yar, which rises in the downs at Niton and drains most of the western Arreton Valley eastwards through Brading Harbour to the sea. The extreme west of the valley is drained by the Medina River, flowing north through Newport to Cowes. The parish church on the little hill referred to is that of Newchurch, where most of the valley's glasshouse industry is now situated.

A deep ferruginous loam derived from the Lower Greensand is the main soil type. There are scattered patches of plateau gravel and gravel terraces, especially around Newchurch, where the somewhat lighter loams are admirably suited for glasshouse as well as early horticultural crops. Along the rivers, small areas of alluvial soil are found, and bordering the downs on either side of the valley narrow areas of Upper Greensand outcrop to form

highly fertile soils. These ferruginous loams are also to be found running in a narrowing strip westward between the downs to Compton Bay, forming a further tract of land most suitable for many market-garden crops—the "forty bushel land" of the old Island farmers.

Corn and stock farming are combined with extensive vegetable growing on the larger farms in the valley. Here a very large proportion of the Island's vegetable and salad supplies are grown; and the standard of their cultivation is very high. Early potatoes, early cabbage, and latterly early cauliflower, overwintered under glass, are grown on the south-facing slopes of the downs around Merstone. Winter brassicas, horticultural root crops and leeks are also successfully grown, and field crops of broad beans, runner beans and peas are produced for the local summer markets. The leading growers have recently improved their packing and storage facilities with good effect.

The Isle of Wight is a popular holiday resort in summertime, when its resident population of about 90,000 is swollen by an influx of from 40,000 to 45,000 visitors at the peak of the holiday period. This has its effect on the production of horticultural crops, which is geared to supply the large quantities of summer vegetables and salads required for consumption locally and by the visitors. The glasshouse industry is mainly situated around the village of Newchurch, as I have said, where excellent conditions prevail for the production of early tomatoes, lettuce, cucumbers and flowers. The light intensity of this area is about the best in Britain, and the climate is extremely mild. It is generally thought that the area could compete favourably with the Channel Islands in the production of early glasshouse crops.

Unfortunately, at present there is no canning, preserving or quick freezing plant on the Island; here is a great opportunity for development. The fruit growing industry is not well developed generally, but there are some thriving orchards in the valley. Coastal areas on the south of the Island are subject to gales and, although soil and other conditions would be satisfactory for fruit growing, the damage by salt spray would prove prohibitive. But many other areas in the Island, including the Arreton Valley, are quite suitable for bush, cane and top fruit as well as strawberries, provided sheltered sites are chosen and proper shelter belts planted. There is a ready market for soft fruit during the summer season, and a great deal has to be imported.

Transport in the Island has changed considerably since the war. The railway line from Newport to Yarmouth and Freshwater has been closed, as have several others in the Island. The main rail service is now from Ventnor to Cowes, via Ryde and Newport. Bus services and road transport are generally adequate.

The Ministry of Agriculture recently completed a survey of potential horticultural areas in the Isle of Wight for the Agricultural Improvement Council. It was found that the Arreton Valley and the previously mentioned land to the west of it were potentially suitable areas for the cultivation of a wide range of horticultural crops, both in the open and under glass. Particular emphasis was laid on the high light intensity, climatic conditions and earliness of the Arreton Valley for intensively-grown glasshouse, salad and vegetable crops.

At the Farmers' Club

The Role of British Agriculture Today

AN economist's view of the trends influencing the present and future pattern of British agriculture was presented at the Farmers' Club on 11th May by Mr. A. Winegarten, B.Com., B.Sc.(Econ.), of the National Farmers' Union. He began by commenting on subsidies. It is regrettable, he said, that many people outside the industry think of agriculture not so much for the contribution it makes to our wealth and welfare as from the standpoint of its apparent cost to the economy. "In real terms the subsidies cost less now than they did five years ago, and constitute a smaller proportion of both the national income and total Government expenditure." They amount to only five per cent of total consumer expenditure on food, and represent the limited premium we pay to ensure regularity, variety and cheapness in our national food supplies.

Since 1945 the most striking change has been the return to the pre-war pattern of output based mainly on livestock, but with the important difference that now a large proportion of our stock is raised on home-grown feed. In recent years the national farm has relied less on milk than formerly, and fatstock sales have increased in importance. But although practically all our requirements for milk, ware potatoes and shell eggs are now being met by British farmers, home production of most other commodities still accounts for only part of our needs.

On the input side, the cost of labour has remained virtually unchanged since pre-war times, chiefly because the unit cost of labour has risen more than that of any other major cost item. Other increases include machinery costs (now 18 per cent of the total, compared with 9 per cent before the war) and fertilizer expenditure, which is also relatively more important than twenty years ago. Expenditure on feedingstuffs, however, has become relatively less important, and so have rents, though the latter are now rising sharply and are expected to assume much greater significance before long.

The agricultural industry's total purchasing power in 1959–60 is estimated at about £1,600 million, £1,240 million of which represents total farm expenses, leaving £356 million as the industry's net income. Mr. Winegarten estimated that the agricultural industry bought £770 million worth of goods and services from other industries—that is to say, 60 per cent of expenses on British farms are incurred by purchases outside the industry. Thus the extent to which British farmers can succeed in lowering their production costs depends largely on price movements beyond their control. Since the demand made by agriculture on the nation's resources of man-power, plant and machinery, new buildings and works and petrol is surprisingly small (Mr. Winegarten quoted 5, 5, 2 and 3 per cent respectively), the idea that large benefits would accrue if agriculture's resources could be employed more profitably elsewhere, is unsound.

Moreover, he said, "the present tendency to play down agriculture's importance from the standpoint of import saving is dangerous, as it exposes our overseas trading account to the vagaries of the economic climate".

On the production side, grass now provides about 70 per cent of the feed for our grazing animals, compared with 65 per cent before the war, and supports many more animals. Cereal production is still higher today than ten years ago despite a declining acreage under cereal crops, but in discouraging wheat production, said Mr. Winegarten, "the Government appears to have overlooked the recent strong demand for feed wheat". Present policy for potatoes provides no safeguard in years when yields are low, and sugar beet output is limited by existing factory capacity, so that we can produce only about one-fifth of our sugar needs. "If only we could have the one new sugar factory for which we have been pleading now for many years."

Livestock producers have raised their output by 50 per cent on a lower volume of imported feed—a remarkable feat. But the desired expansion in pigmeat, beef, mutton and lamb production has been checked recently, partly by a reduction in guarantees as with pigs and sheep, and partly by the Government's failure, in Mr. Winegarten's opinion, to realize that at the present level of guarantee beef production is not very profitable. "Indeed," Mr. Winegarten said, "for most commodities official policy is either to halt any expansion in output or to encourage contraction." How, then, can the future pattern of production be arranged to avoid lower farming incomes?

Incomes could be increased by five methods: increasing guaranteed prices at existing output levels; reducing costs relative to guaranteed prices; improving marketing; reducing the number of farmers; or increasing the size of the total market and the home producers' share of it. Analysing these in turn, Mr. Winegarten concluded that improved marketing techniques probably offer the most attractive solution. Expenditure on food is expected to rise by 15 per cent in the next five years, with an increasing share being spent on livestock products and fresh fruit and vegetables. These changes are going to present farmers with great opportunities to supply an increased proportion of the U.K.'s food supplies. "It is clearly a mistaken policy to talk of checking food production when about half the produce we consume is imported."

There is ample evidence that farmers are responding to the challenge by taking the initiative in measures to improve their competitive position. On the national scale the Fatstock Marketing Corporation is a striking example of this, and the creation of local organizations like the Kentish Bacon Producers' Association is no less enterprising. The N.F.U., realizing the urgent need to find out exactly what the consumer wants, has already started consumer research projects which include meat, apples, herbage seeds and tomatoes. There are 65 machinery syndicates in existence, and the Agricultural Credit Corporation guarantees bank loans made to credit-worthy farmers.

"But unless the Government's guarantees are right," concluded Mr. Winegarten, "these efforts at self-help will be nullified through a worsening of the industry's financial position. Whether agriculture continues to move forward depends essentially on whether, in future Reviews, an equitable sharing of the value of increased efficiency can be agreed upon."

Sylvia Laverton

In Brief

INFESTATION CONTROL ADVISORY COMMITTEE

A committee, under the chairmanship of Professor J. B. Cragg, B.Sc., M.Sc., Professor of Zoology in the University of Durham, has been appointed by the Minister of Agriculture to advise and report annually on the programme of experimental and research work of the Infestation Control Laboratory of the Ministry. The Laboratory is part of the Advisory Service and Infestation Control Division and is situated at Tolworth, near Surbiton, with a field station at Worplesdon, near Guildford.

EGG-BORNE DISEASES

In an article contributed to the March issue of the *Journal of the Animal Health Trust*, the Houghton Poultry Research Station calls attention to the dangers which a few infected eggs can introduce to large-scale incubation. "Infection spreads mainly from the down or fluff of chicks hatched from infected eggs; it is carried round by the air currents of the incubator and is inhaled by other chicks, thus setting up extensive outbreaks. Further outbreaks may arise subsequently when other chicks are hatched in machines containing infected fluff and dust; moreover, infection can be airborne to other incubators or hatchers in the same room or premises. Infected chicks can also infect the hands and clothes of attendants—particularly sexers—who in turn transmit infection to other chicks. Infection can also be spread during transit in chick boxes and by the use of contaminated chick-box linings.

"Disease agents which have been shown to be transmitted to chicks via the egg include those responsible for B.W.D. (pullorum disease), fowl typhoid, other salmonella infections, and a number of respiratory infections such as C.R.D. (chronic respiratory disease), infectious bronchitis and infectious synovitis. There is also evidence for the egg transmission of other diseases, such as epidemic tremors. In addition to disease agents which may originate in the breeding flock, it is also possible for eggs to become infected when handled by hatchery workers who have certain types of skin ailments or who have been in contact with infected chicks or incubator debris.

"Apart from these specific diseases, it has been found that many of the types of bacteria normally present in the digestive tract of the fowl can interfere with the development of the embryo or chick, should they gain access to the embryonic fluids in sufficient numbers. Omphalitis and yolk-sac infection are examples of conditions produced by bacteria of these types.

"The control of these diseases falls under five headings; the detection and removal of infected birds from the breeding flock; the hygiene of the egg; the hygiene of the incubator; the hygiene of the hatchery premises and the hygiene of the hatchery personnel."

Reprints of this four-page article, which will be of value to everyone concerned with modern hatchery practice, can be obtained from The Animal Health Trust, 14 Ashley Place, Westminster, London, S.W.1, price 3*d*. each, plus postage.

WEED RESEARCH ORGANIZATION

The Agricultural Research Council is setting up a new Weed Research Organization which will asume some of the present functions of the Council's Unit of Experimental Agronomy at Oxford University. The new Organization has been created for the purpose of extending the applied research which lies between the

basic scientific investigations being carried out at the Unit and the introduction of new methods of weed control in agriculture and horticulture.

To provide the facilities required to enable the Organization to carry out this work, the Council has acquired a farm near Oxford where a laboratory and other buildings are to be provided.

The Director of the new Organization will be Dr. E. K. Woodford, who is at present Assistant Director, under Professor G. E. Blackman, of the Council's Unit of Experimental Agronomy.

The Organization will maintain close liaison with the Unit which will continue its main purpose of fundamental research concerning the factors which determine the selective action of compounds toxic to plants.

TELEVISION BLIGHT REPORTS

For the first time farmers in Wales and the West of England, the Midlands and East Anglia will, this season, receive up-to-date television blight reports covering these areas of the country. They will appear each Sunday from 5th June to 28th August during the farming programmes "The Other Man's Farm" (Midlands and Wales and West) and on the Anglian T.V. farming programme "Farming Dairy".

Each report will be on the television screen for at least 60 seconds and they will include a map of the country, indicating the areas where blight outbreaks have occurred.

SILVER LEAF DISEASE

Most of the trouble from silver leaf disease which takes its annual toll of plum trees—and of some apples—could be avoided by routine orchard hygiene. The disease is caused by a parasitic fungus and is easily identified by the silvery appearance of the leaves—at first often on just a single branch. This is merely a symptom; however, the fungus is within the wood itself, where it produces a soluble toxic substance which is then translocated by the sap to the leaves. Any branch of a tree affected by this fungus will, when cut through, always show a dark brown staining. The fungus produces its fructifications on dead wood. In appearance, these fructifications are flattish crusts several inches long or forming bracket-shaped projections ¼–1 inch wide, arranged in tiers on the dead bark and showing purple-mauve when moist and fresh. The spores of the fungus are blown by the wind to infect other fruit trees which have been wounded or injured by pruning, or natural cracking. The silvered leaves are not a source of infection; neither can the disease be spread through the soil.

The essence of control is therefore simple—to prevent the formation of fructifications of the fungus by promptly removing and burning all dead wood and by dressing tree wounds as soon as they have been made or noticed. It should be remembered that the fungus fructifications may be found on *any* dead or dying trees—and even old stumps and logs, not only of plum and apple but of many other trees.

So that growers and gardeners will become more aware of the danger that lies in neglecting the spread of silver leaf disease, the Ministry has just issued a new publicity leaflet. Copies are obtainable free from Divisional Offices or from the Ministry's publications Section, Ruskin Avenue, Kew, Surrey.

R.A.S.E. RESEARCH MEDAL FOR 1960

Professor R. L. Wain, of Wye College, has been awarded the R.A.S.E. Research Medal for 1960, in recognition of his work on plant growth-regulating substances and selective weed control through systemic fungicides and insecticides.

This is the sixth award of the medal, which can be given annually for agricul-

tural research work of outstanding merit undertaken in the United Kingdom, and carries with it a prize of 100 guineas.

Dr. Wain, who is 48, is Professor of Agricultural Chemistry in the University of London at Wye College. He is also Honorary Director to the Agricultural Research Council's Unit of Plant Growth Substances and Systemic Fungicides, which has been set up at Wye to further his work and that of his colleagues.

LOOKING AHEAD

This is the title of the Ministry's exhibit at the Royal Show, which will be held at Trumpington, Cambridge, on 5–8th July. It will focus attention on such fundamental problems as the preservation of soil structure, developments in farm building design, the control of major pests, the economical rearing of livestock, and some of the difficulties facing the horticultural industry.

The Agricultural Land Service emphasizes simplicity as the keynote of farm building design, with spans free of tie beams and without small section members which limit headroom and add to maintenance costs. Steel, timber and concrete have been used to show structural framework in contemporary design.

It may be stating the obvious to say that soil in good heart is fundamental to the prosperity of any agriculture, but it cannot be said too often. Most people probably think of the fertility of the soil in terms mainly of nutrients and organic matter, but such factors as weed control, soil-borne diseases, drainage and keeping a good structure must claim equal attention.

The National Agricultural Advisory Service will be showing several modern rotations, most of them deriving from the old Norfolk four-course. These have been developed by varying the length of the ley or by doubling the white straw crops. One rotation shows a five-year ley alternating with three arable crops; another shows a three-year ley used as a basis for a more intensive system of cereal cropping. Examples will be shown also of contemporary practice in cash cropping, emphasizing root crops and, alternatively, cereals. It will be interesting to compare the organic matter and nutrients returned to the soil and the dry matter produced under each rotation.

Other items which should attract considerable interest are the possibilities offered by the Horticulture Improvement Scheme, hydrocooling of vegetables before they leave the farm, the canning and quick freezing of vegetables and soft fruits, virus diseases of fruit trees, the breeding of beef from single-suckled herds, and how to deal with hypomagnesaemia.

The Ministry's exhibit, close to No. 2 entrance, is Stand No. 32, Avenue J. The Ministry's officers look forward to meeting you there and chatting over with you your problems and experiences.

PLANT PATH. LAB'S. NEW PREMISES

On 13th May, the Minister of Agriculture, the Rt. Hon. John Hare, O.B.E., M.P., opened the new building of the Plant Pathology Laboratory at Hatching Green, Harpenden, Herts.

In 1914 an institute for plant pathology was established at the Royal Botanic Gardens, Kew, and another for agricultural entomology at Manchester University. Four years later the research side of the plant pathology laboratory at Kew, and the entomological work at Manchester were transferred to Rothamsted, while the administrative and advisory side of the Kew laboratory became part of the then Board of Agriculture. This new Plant Pathology Laboratory remained at Kew for a time, but was transferred to Milton Road, Harpenden, between October 1920 and April 1921. Since the 1939–45 war there has been a steady

expansion in its work, and there is now a total staff of about 60, including 35 specialists in entomology, plant pathology and crop protection chemistry.

The Plant Pathology Laboratory is best regarded as an intelligence centre and clearing house for all matters relating to plant pests and diseases, including survey and forecasting work. It gives specialist advice to the N.A.A.S. and so to the farmer—much of this by way of technical literature. It plays a leading part in campaigns against particular pests and diseases like Colorado beetle and fire blight of pears. Last, but not least, it has an international reputation: many inquiries come to it from overseas.

VISIT YOUR EXPERIMENTAL HUSBANDRY FARM

During the summer the Ministry's Experimental Husbandry Farms will be holding open court, and many farmers will be accepting invitations to see what is going on.

Before the results of work at Agricultural Research Institutes in this country and overseas can be put into practice by farmers, tests must be made under the varying farming conditions which might be applicable. Whatever the subject, considerable development work is usually necessary before the improvement can be incorporated into farming practice. In addition, there are a number of husbandry practices which require to be studied for a long period under controlled conditions. For example, a series of experiments is in progress to compare the long-term effects of different methods of disposing of straw; by burning, ploughing-in, complete removal or returning it as dung. There are also a number of local problems which require examination under similar conditions. These three types of work cannot be undertaken on a commercial farm because of the interference which would be caused to ordinary farming operations.

During the past fourteen years the National Agricultural Advisory Service has set up twelve farms specially for this work. They are known as the Experimental Husbandry Farms, and were chosen to represent the main soil and farming types in England and Wales. They are essentially farms on which experimental and development work is carried out, and are in no sense demonstration farms either for established or for new methods and techniques. There is, however, much of immediate interest which is fully explained and therefore readily understood by the ordinary farmer.

Much of the work is inevitably of a long-term character, because it would be of no service to farmers throughout the country if hasty conclusions were drawn before proper testing in the varying conditions of one season and another, and before the effects of the practice were fully apparent. In work with livestock, time is needed to carry out tests under as varied conditions as possible, and large numbers of animals are necessary to allow for the variation between one animal and another.

Each farm has its own Director who is responsible for the farming and experimental work. He has the helpful guidance of an advisory committee, composed of local farmers, representatives of universities and research stations, and a number of N.A.A.S. officers representing regional and county staffs.

Apart from the Open Days, which are widely advertised, it could be well worth any farmer's time to visit his regional Experimental Husbandry Farm as one of an organized party. The Directors will gladly make the necessary arrangements if the leaders or secretaries of groups and parties will get in touch with them—as early as possible.

BOOK REVIEWS

Economics for Agriculture: Selected Writings of John D. Black. Edited by J. P. CAVIN. Harvard University Press (U.S.A.), Oxford University Press (London). 96*s*.

John D. Black is one of the Grand Old Men of American agricultural economics: he is also the most versatile of them all. Production economics, land use, forestry, marketing, prices, population and food supply, policy, research methods—these are examples of the subjects which he has discussed as a master during the last 45 years. Such virtuosity has provided some of his colleagues and former pupils with an opportunity to pay tribute to his accomplishments in an unusual, and probably unique, way. They have selected for publication examples of his writings in each of twelve branches of agricultural economics, prefacing each with an introduction written by one of today's greatest authorities on it.

With such a wide field to cover, *Economics for Agriculture* gives no more than an outline of Black's work and thought, in spite of its 700 pages. But it also provides, through the introductions to each subject, a profile of the first half-century of agricultural economics in the United States—for very little work had been done in this field before 1915, when Black first turned to it professionally.

Those to whom "John D" is more than a name will almost certainly find their greatest interest in the pen portrait contributed by his Harvard colleague, J. K. Galbraith. Here is the story of a boy born in a farm family of ten children, never affluent, but so dedicated to education that the elder children used their earliest savings to put the younger ones through school and college. Black himself was 32 years old before he obtained his Ph.D. degree, and he had already taught English in school for several years, besides obtaining a considerable reputation as a track athlete.

His readers can be thankful that such a prolific writer had spent so much time as a student of English, for there is a lucidity about his prose which many of us might envy. But he remained first and foremost a teacher; and although, as his biographer says, "it has never been his tendency to argue matters at great length with a view to persuading the opposition and, perchance, adjusting his own view", he accumulated students in a way which was ever a surprise as well as a matter of some chagrin to his colleagues, both at Minnesota and Harvard. Perhaps his secret is the virtue which he himself attributed to his well-known book *Farm Management*: his down-to-earth economics.

W.H.L.

Man and Bird and Beast. JOHN MOORE. Collins. 18*s*.

Mr. Moore excels in rural reminiscence and delights in the recording of present happiness and curiosity, ingredients which make up the greater part of his latest book.

Perhaps this is a book for the townsman rather than the countryman, but Mr. Moore has spread his net wide, to cover among other things "caddlement", the problem of river pollution, a military aversion to daisies, rubber on bonfires, the "chissomness" of snowdrops, and many other country troubles and delights. The greatest charm of the book is the author's sympathy with his fellow countrymen, who may be obstinate and difficult but are never unlikeable. My own favourite is the country-house cricketer who believed himself to be the rightful king of England and would complain gently of the mistake that was keeping him off the throne, and "then go out to bat and make fifty with the most orthodox strokes imaginable".

Mr. Moore has a keen ear for country words. "Caddlement" he defines as a trifling occupation; a "shepster" he tells us is a starling, from the bird's association with sheep. And "the other day a man complaining to me about his wife gave me two new words in a sentence: Her's allus *kankin'* at me, he said, and her's allus *hurrooshing* me along . . . One o' these days, he said, half to himself, us'll see her on a hazel-stick, flyin' over the garden".

It will be news to many, as it was to me, that a Victorian naturalist once tried to interest a small child, the daughter of a friend, in beetles by writing 2,500 lines of verse about them in the metre of *Hiawatha*. Also that, much more recently, schoolboys laid minefields of nitrogen triiodide against cockroaches; apparently the chemical is a sensitive explosive when dry, and the unfortunate insects have only to tread on it to go up in smoke. (A similar risk faces the schoolboys, of course!)

Here, then, is a very human chronicle of country contentments, which in its quiet way will bring pleasure, and not a little knowledge of wild life, to many people.

A.M.R.

Income Tax—Maintenance Relief and Agricultural Allowances. F. E. CUTLER JONES. Sweet and Maxwell. 32*s.* 6*d.*

Since the first publication, five years ago, of Mr. Cutler Jones's book a number of changes in taxation have been brought about by Finance and other Acts, and there have been statements in Parliament and modifications in Revenue practice.

The appearance of a second edition of this informative work is therefore welcome. It has been brought up to date, some less interesting sections shed, and its arrangement revised. Indeed, more revision might have been done if the aim had been to marshal the subject on the taut lines of a text-book. Nonetheless, under the freer plan adopted, practical experience and numerous legal and Parliamentary pronouncements have been brought together in a very full commentary on a section of income tax law which particularly concerns farmers, owners and landlords. The book should also constitute a useful work of reference for many outside agriculture, and for practising accountants.

Attention is devoted to numerous distinctions in income tax law—e.g., between repairs, replacements and rebuilding, and between the different treatments of these allowances in tax computations. Difficulties of definition, and border-line cases in the field of capital allowances and maintenance claims, where the position may be determined in part by Revenue concessions, are considered, and an indication given of points on which Revenue practice may vary.

Because of the large amount of work being done at the present time under the Farm Improvement Scheme, the sections dealing with additions or improvements to farm buildings or cottages, and with expenditure on works and fixed equipment, will be of special interest. Problems may arise as to the proportion of such expenditure that may rank for maintenance claims, as opposed to capital allowances, and it may be to the advantage of landlords and farmers in such cases to consider how they may be affected.

Sections are included on a wide variety of other topics, such as the definition of farmhouses, surtax, and the machinery of appeals procedure.

One or two slips have occurred in the indexing system, but these do not affect the references to statutes. In addition to the general index a useful table is provided of cases, and another of statutes, in which references to the text are given against each of the 130 or more statutory sections or sub-sections with which the book deals.

P.M.R.

Fertilizers and Profitable Farming. G. W. COOKE. Crosby Lockwood. 15*s.*

The names of Rothamsted and Dr. G. W. Cooke are synonymous with sound fertilizer practice, and this new book enhances the reputation of both. It is written in terse style and without padding of any kind, reminiscent of Dr. Cooke's lecturing technique, which earned him the Farmers' Club award in 1959. Like the fertilizers he advocates, the book contains no inert material, but some might like to see certain sections enlarged. For example, the important topic of current fertilizer practice, based on the Rothamsted surveys, is summarized in only two pages. Possible criticism on this score is, however, forestalled by a classified list of references.

At the outset, Dr. Cooke advocates a unit system for evaluating fertilizers, which enables any general recommendation in terms of plant food units to be easily converted into cwt per acre of actual fertilizer. If it was universally adopted, many of the difficulties facing advisers in making recommendations would be overcome. Throughout the book this system is used, and it is noteworthy how quickly it becomes accepted and how the book gains in clarity by its use.

As would be expected from one associated with Rothamsted, the sections on the most profitable level of fertilizer application to arable crops cannot be faulted. The recommendations are clear and concise and are backed by a great weight of experimental evidence. Not merely are quantities defined, but the all-important factors of placement and timing are given due emphasis.

The section on grassland is rather less convincing, possibly because Dr. Cooke, while emphasizing that manuring cannot be divorced from management, sets himself the impossible task of trying to deal with the subject in a dozen pages. There is, however, a masterly summary, in tabular form, of fertilizer recommendations for different systems of grassland management. The inevitable reference is made to practice on the Continent and in New Zealand, where growing conditions and fertilizer prices are very different from our own. Perhaps less than justice is done to all the post-war work carried out in England, which has created a fund of technical and economic knowledge about grass production and utilization, but which remains to be put into general practice.

Fertilizers and Profitable Farming will have an equal appeal to farmers and their advisers. To those prepared to follow its advice, the book will more than justify its title, and provide many opportunities for more profitable farming.

A.W.S.

The Agricultural History Review (Volume VIII, Part I, 1960). Edited by H. P. R. FINBERG. The British Agricultural History Society. 12*s.* 6*d.*

History began a long time ago and it ends now, just as you read these words. The contents of the latest issue of the *Agricultural History Review* do not quite reach these limits, but they fall very little short of them. Some of the evidence on early agriculture in Scotland summarized by Mr. Stevenson dates from the neolithic period, while Professor Mollett's study of the Wheat Act of 1932 concludes with the establishment of the free market for cereals in August 1953.

The remaining articles, less extreme, lead us gently back to the more familiar days of the agricultural revolution. Mr. Jones describes changes in chalkland farming in eighteenth-century Hampshire —did Jane Austen ever comment at tea-time on the farmsteads arising on the newly-hedged downland?—and Professor Pawson quotes the prospectus of an ambitious but premature attempt to found an agricultural society, complete with an experimental farm, in Northumberland in 1797.

There are also nine pages of book reviews and, perhaps the most significant section of the periodical, a bibliography of some two hundred books and articles issued since September 1958. On an average, therefore, more than ten publications of potential interest to students of agricultural history appeared every month. The achievement of the historians is obvious. So is the need for the literary equivalent of advisory officers who will make their mass of detailed findings more readily available to the general reader.

N.H.

The Calf (2nd Edition). J. H. B. ROY. Farmer and Stock-Breeder. 9*s.* 6*d.*

By including an extensive and well-selected list of references, the author has improved upon the first edition of this book. In particular, the literature relating to calf nutrition and management is well reviewed, especially regarding findings in the past few years.

Farmers would possibly prefer more guidance about the relative merits of the different methods of rearing, and their application under different conditions. The tabulation of a large number of alternative rations for the same purpose is confusing, and more attention might have been given to the basic principles for formulating diets. Many of the quoted rations have been developed from experience, and often have little scientific basis. An example of this is the recommended concentrate mixture for cattle over six months old, which on calculation is found to contain twenty per cent crude protein; in fact a level of 11-13 per cent has proved adequate for this class of stock.

An index might have been more useful than the detailed list of contents, but the book contains valuable information and will serve as a useful guide to students of animal husbandry.

T.R.P.

Agriculture and Urban Growth. G. P. WIBBERLEY. Michael Joseph. 21*s*.

Dr. Wibberley has covered a good deal more than competition between urban and agricultural uses of the land. Arising out of his analysis and the problem encountered in handling the available data, an eloquent plea is developed for more and better documentation of information about land use in this country, and for the elaboration of techniques for assessing the costs and returns of various land uses.

In view of the scarcity and incompleteness of the existing data, the author has performed a signal service in collating what there is. He estimates that between 1950 and 1970, some 600,000 acres net of agricultural land will be taken for urban development. Having described a method for choosing sites for this development which attempts to minimize the total economic loss—not just loss of agricultural production — Dr. Wibberley addresses himself to the question whether, and by what means, the resulting reduction of agricultural output should be made good by increased production from home resources, or by imports financed by greater exports of industrial goods. Concluding that the replacement should come from our own land—and there are some who will quarrel with this view—he proceeds to show that garden production from town land is not very great.

The argument is then developed in terms of the capital cost of replacing, by various means of reclamation and improvement, the net loss of output per acre urbanized. His figures, which are based on 1955–56 prices, show that improvement of livestock rearing farms on the uplands would cost £351 to make good the production lost. Reclamation of opencast coal and ironstone workings would cost £820–3,772; coastal reclamation, £118–225; general intensification of all agriculture, £165; reclamation of derelict woodlands, £127, and of dry sand and gravel workings, £137.

The author concludes that his evidence "suggests that the bringing in of new pieces of land which can be farmed with existing farm units looks at least as economic a proposition in this country as attempts at intensification of existing (lowland) farms". Large-scale reclamation and improvement of marginal areas seems to be a dubious proposition. But, as the author remarks, without further evidence "arguments as to the desirability of certain areas of agricultural land for other purposes will continue to flounder in a morass of unrelated and emotional detail".

M.C.

The Small Family Farm—A European Problem. O.E.E.C., Paris. H.M. Stationery Office, London. 9*s*. (9*s*. 7*d*. by post).

Thirteen countries of continental western Europe contributed to this study of methods of creating farms which could yield at least a minimum income. This subject is more widespread and enduring than the "family farm" label of the report suggests. Every country has some farms which give only a poor living, and these poor livings are always with us.

A country's attitude to its lowest-income farms is largely determined by the importance of agriculture to its national income, and the size of that income. Where agriculture must be the main occupation for some time to come, action is concentrated on, and limited by, the need to increase incomes from farming. Industrialized countries can afford to regard a minimum farm income as a tool for controlling urbanization and the balance of trade. In predominantly agricultural countries the level of an adequate income, which all farms should provide, is decided relatively by the standard of living of rural communities or other agricultural workers, and absolutely by the lowest acceptable standard. In industrialized countries it is set by non-agricultural employments, and farmers are required to receive a fair reward and not only be maintained physically. In some of these countries a fair reward includes an allowance for management and interest on capital, as well as payment for manual labour.

Like Britain, the thirteen countries have needed the concepts of "an average occupier", "a sufficient livelihood", and "an income equal to the average earnings of an agricultural worker". To achieve their variously-chosen adequate farm incomes they plan to expand farm businesses both in area and intensity of production. Techniques for increasing profits from a given area are common to all; extending or consolidating farmlands calls for methods which vary according to historical legacies and present situations of landholding.

The report details the different administrative and financial arrangements for creating "economically viable agricultural holdings".

Emphasis is given to the need for farms to be altered in area and management over the years to produce incomes increasing at rates comparable to other incomes. The structure of the industry should be such as to allow the size of farms to change easily—generally increasing—in response to technical developments and economic progress. The "small farm problem" would then be dealt with by continual small adjustments, and not by occasional agonizing re-appraisals.

A.V.V.

Animal Production (Vol. 2, Part 1, March 1960). Edited by I. L. MASON and GERALD WIENER. Oliver and Boyd. 17*s.* 6*d.*

The practice of drug administration to facilitate increased growth rate in fattening lambs and cattle is now widespread, but still the subject of some controversy. Four of the eleven papers in this issue deal with this topic.

Preston and his co-workers showed that hexoestrol-implanted ram, wether and ewe lambs showed a greater rate of liveweight gain than untreated controls. These lambs all ran with their dams on pasture, and received creep feed. In another trial with weaned ram lambs fed a pelleted ration indoors, the hexoestrol-treated lambs showed a lower rate of gain than untreated controls. Using the tranquillizing drug, hydroxyzine, Preston and other co-authors showed that cattle gained weight faster and made better use of their feed than controls.

Burgess and Lamming draw attention to some untoward side effects in lambs treated with diethyl-stilboestrol. The same authors showed that diethyl-stilboestrol, hexoestrol and testosterone favourably influenced growth rates in fattening beef steers. They describe some results pertinent to the elucidation of the mechanism producing this effect.

Hypomagnesaemia appears to be an increasing hazard to the livestock industry, and has been attracting a good deal of notice. Many workers have drawn attention to the effect of potassic fertilizers in increasing the incidence of this disease. Two ways in which this might arise are as follows. It is well known that excess potassium leads to lowered magnesium uptake by plants, and this would result in a reduced intake of this mineral by the grazing animal. The high dietary intake of potassium might interfere with absorption, or subsequent metabolism of magnesium in animals on such pastures. Blaxter and others show clearly that in experimentally produced hypomagnesaemic tetany of calves, this second possibility does not occur. Potassium supplements in the diet had no influence on the induction of tetany, or on the other aspects of magnesium metabolism which were investigated. This was in spite of using toxic amounts of potassium.

M.K.L.

Long Ashton Research Station Annual Report, 1958. 15*s.*

Long Ashton has progressed considerably since the days when it was "The Cider Institute" and a fruit research station for the West Country, with a special interest in problems of nutritional deficiency. Today the research interests are wide in range and geographical distribution. True, the essential purpose is much the same, and the interest in micronutrients continues strongly, though this will no longer be separately identified with a special A.R.C. Unit. Some of the projects, however, are concerned with help for far-off places—from the West Indies to Borneo, from Finland to West Africa, and it is only possible to touch on a few topics.

Much of the nutritional work is directed towards a deeper understanding of the functions of mineral nutrients and their effects on growth behaviour and the metabolic activities of the plant. For example, the leaf chlorosis found in manganese deficiency of fruit plants may be the result of the bleaching action of sunlight, against which manganese may protect the chlorophyll in normal leaves. When the plant has sufficient manganese, bleaching is prevented, and the leaves remain green. The tissue culture method makes possible precise studies of the effect of nutrients on the cell machinery of plant growth and the behaviour of growing points. Some aspects of crop behaviour are thus made clearer, though others may become more puzzling—the combination lock still awaits the right key.

In field manuring experiments, the importance of information on the nutritional

status of the soil has been realized for a considerable time, but long-term trials show the need to assess, at the outset, the nutritional status of the fruit plant, if the results are to be properly understood.

Success in promoting development in some fruits by treatment with growth substances still eludes the grasp—a little success here and a disappointment there; but the part played by seed auxins in early fruit growth and prevention of the June drop is becoming clearer.

Problems of spray application also loom large. The underlying causes of spray damage to fruit trees, the assessment of toxic residues, and the complementary studies of the efficiency of spray cover and the development of prototype spray equipment are reported on.

Coming right down to earth, the old problem of trying to hasten the decay of tree stumps has been put to practical test, only to show that current recommendations are ineffective in practice. Another field study of the flowering and harvest dates of black currants brought out the useful point that picking time can be predicted reasonably well from the flowering dates of many varieties.

Much pioneer work for cider making and the development of fruit juice products has been done at Long Ashton. An interesting survey of cider factories shows the seriousness of local problems of "weed" yeasts and other cider-spoiling organisms, and suggests the use of new techniques and equipment in factory practice. Even the interests of the housewife are looked after in the work on domestic food preservation, and the effective use in the home of modern methods and new materials for canning, jamming and freezing fruits and vegetables. Sooner or later, these recommendations find their way into bulletins, leaflets and women's magazines, or as new aids and products on sale at chemists or hardware stores.

Copies of the report are obtainable from the Secretary, Long Ashton Research Station, Bristol.

R.T.P.

In-place Cleaning of Dairy Equipment. Society of Dairy Technology. 10*s*.

The Society of Dairy Technology is to be commended for the timely publication of this manual. It has been prepared by a group of well-known workers in the fields of dairy engineering, chemistry, bacteriology and dairy technology, under the chairmanship of Mr. H. S. Hall of the National Institute for Research in Dairying. The result is a readable and authoritative guide to the principles and practice of this comparatively new subject.

It is pointed out by the authors that, whatever method is used in the cleaning of milk equipment, the procedures for each are basically similar, namely the cleaning and sterilizing of the surfaces of equipment with which milk comes in contact.

A discussion of these basic principles is followed by chapters dealing with "Methods and Equipment for In-place Cleaning", "The Supervision and Control of In-place Cleaning" and, finally, an appraisal of this new method in which the engineering, bacteriological, chemical and economic aspects are discussed.

In-place cleaning is not without its pitfalls, and any dairyman who contemplates changing over to it would find it profitable to study this manual, as also would all those who are concerned with the cleanliness of dairy plant.

Copies of this book are obtainable from the Society of Dairy Technology, 17 Devonshire Street, London, W.1.

G.T.M.

Taxation of Woodlands in England and Wales (5th Edition). 3*s*.

Home-grown Timber Prices and Forestry Costings. 5*s*. Both by CYRIL E. HART.

The long-term character of timber growing makes it a special subject for the tax collector, whether he is concerned with income tax or estate duty. Provisions were made in the Finance Acts of 1909 and 1915 to ensure that woodland owners should be more fairly assessed, always provided that they treated their woods as proper business concerns. The larger estates have long taken advantage of the concessions available, but undoubtedly many small woodland owners, including farmers, still inadvertently pay more tax than is necessary.

Everyone who is investing in young plantations, or who has to deal with the settlement of an estate carrying timber, will find the booklet *Taxation of Woodlands in England and Wales* a straightforward guide to a complex, but financially important, subject. Incidentally, the

booklet applies equally well to Scotland and Northern Ireland.

Anyone with an acre to plant, or even only a few trees to sell, will find that *Home-grown Timber Prices and Costings* will also well and speedily repay its modest cost.

Although the value of home-grown timber, from all sources, must now exceed £5m. a year, nobody has hitherto ventured to publish a list of current prices. Timber marketing has been a mystery, with the merchant holding all the inside information and weaving all the magic spells. The bigger timber growers, able to attract inquiries and tenders from several sources, have always fared much better than the small man, whose only source of knowledge has been local rumour. It is small wonder that he has often felt bemused and bewitched, as timber is sold sometimes by weight, by volume, by the piece or the foot-run; and price varies with size, species, situation and the state of the market. One of his great disadvantages is that he only comes into the market with a parcel of trees to sell at intervals of several months or even years, and so cannot always know who the ready buyers are.

Now Cyril Hart, who is Lecturer in Forestry at the Royal Agricultural College, Cirencester, has brought together current prices quoted by a wide selection of active purchasers of round and partially prepared timber. These include timber merchants, the National Coal Board, and the makers of paper pulp, wood wool, chipboard and hardboard. There are also details of sample costs for forming plantations, and for preparing timber for market.

Copies of these booklets are obtainable, post free, from the author at "Chenies", Coleford, Gloucestershire.

H.L.E.

Investment in Orchards. (Economics of Fruit Farming, Report No. 5). R. R. W. FOLLEY and K. C. YATES. Department of Agricultural Economics, Wye College. 5*s*.

The study of horticultural economics is quite new, and many problems have already arisen which must be solved if certain investigations now being carried out by the universities are to be brought to a satisfactory conclusion. Because of the complexity of any horticultural business, these problems are more difficult to resolve than those to be found in agriculture. From our work at Bristol, we know that the question of the cost of establishing a plantation or orchard, and the methods to be used in calculating such costs, have been very much debated between growers and ourselves.

Folley and Yates have tackled this problem thoroughly, and the mass of very careful calculations, supported in almost every instance by a reasoned context, omit nothing that can be regarded as in any way significant.

Apart from the statistics and calculations, this very useful publication tells an interesting story of the growth of an orchard from the time of planting, just after the end of World War II, until today. It shows clearly the extent to which a monetary investment had to be made, and the years of waiting for a financial return. Truly can it be said that this particular grower had the courage of his convictions, and faith in the future. A total of £326 per acre had to be invested to establish a new orchard.

As the authors rightly say, the volume of data in this publication could not have been compiled without the generous help of the grower, Mr. Thomas Neame, V.M.H., who made available his records over so many years.

C.V.D.

British Council Annual Report, 1958–59. 1*s*.

If the image projected by the British Council is that of a mildly intellectual do-gooder, not above a little gentle pro-British propaganda on occasions, then it is distinctly out of focus. The latest annual report should help to make the Council's activities clearer.

One of its most rewarding tasks is helping to meet the passionate and insatiable demands for education in the quickly-developing areas of the Near and Middle East, Asia and Africa. This is accomplished by helping to teach English which, in most of these places, is the key to higher education; and by providing English books and periodicals. Four-fifths of the British Council's resources are used in these areas.

One of its main aims is to create mutual friendship and understanding, and it believes personal contacts are of first importance in achieving this. Therefore the

Council devotes itself to the welfare of overseas students in Britain (over 40,000 of them at present); to the administration of 33 British and international fellowship and scholarship schemes; and to arranging exchange visits between scientific and professional people to and from almost anywhere in the world.

Among agricultural activities last year, the British Council sponsored a grassland agronomy course at Hurley; one on mineral nutrition of farm animals in Aberdeen; and another at Silsoe on agricultural engineering. Agricultural officers from Uganda came to Britain for a study tour, and British universities were hosts to a German agronomist, a Swedish veterinary expert and an Italian horticulturist.

Copies of the report are obtainable from the British Council, 65 Davies Street, London, W.1.

S.L.

Grassland Manuring (Potash Booklet No. 1). Potash Limited.

Although today no one denies that the rational use of fertilizers is essential to good husbandry, their role in grassland farming remains less widely appreciated than in arable cropping. Research at Cockle Park brought early recognition of the value of phosphates, especially for pastures used for rearing and fattening purposes.

More recently the beneficial effects of nitrogen in increasing output and extending the grazing season have been demonstrated and used to advantage. But a shortage of potash just when the pattern of grassland farming was changing rapidly prevented farmers from learning the value of this plant food, although its importance, especially for promoting clover growth, was shown at Rothamsted over sixty years ago. Indeed, the Rothamsted grassland recommendations of 1900 mention amounts of N,P and K larger than the average dressings in use today.

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Copies of this booklet are obtainable free from Potash Limited, Field Service Department, Norfolk House, St. James's Square, London, S.W.1.

S.L.

Books Received

National Institute of Agricultural Engineering Annual Report, 1958–59. 17*s.* 6*d.*

Fortieth Annual Report of the Forestry Commissioners for the Year Ended 30th September, 1959. H.M. Stationery Office. 5*s.* 6*d.* (5*s.* 11*d.* by post).

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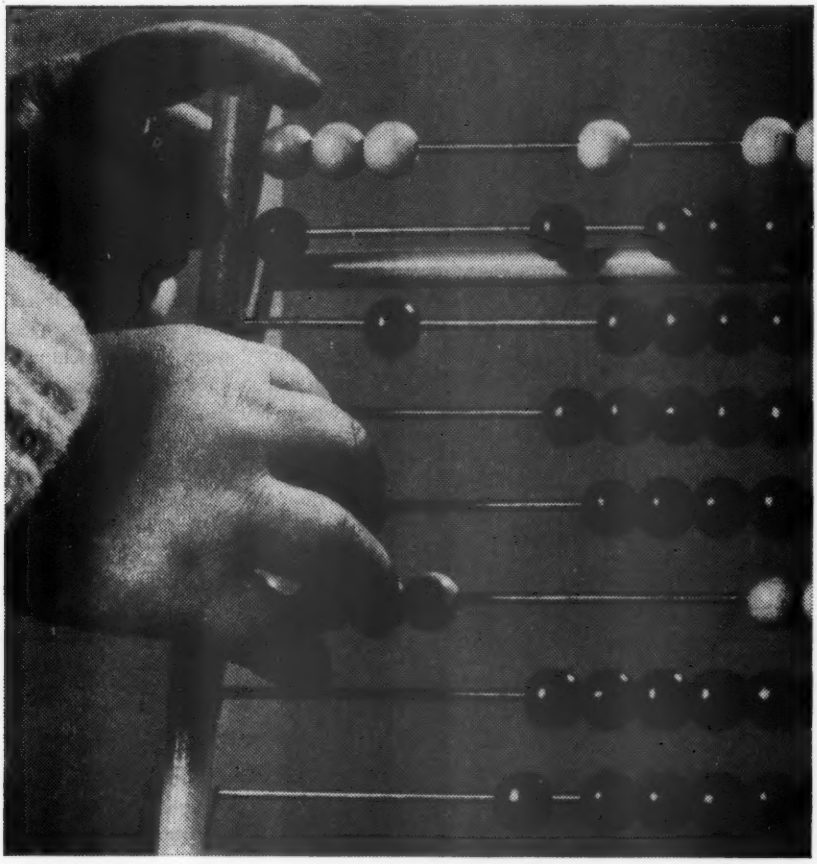

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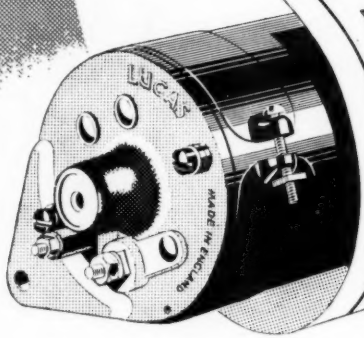

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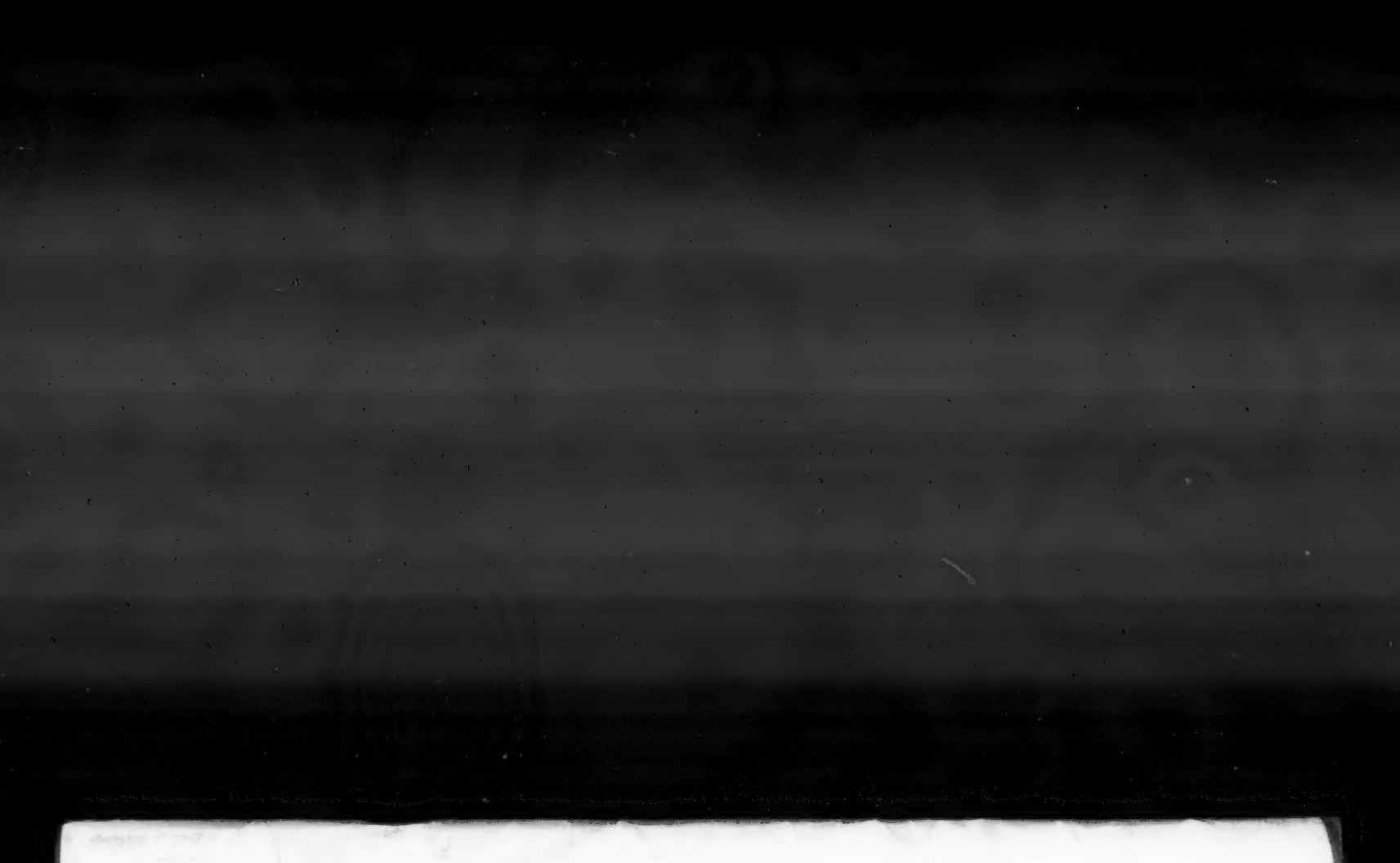
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